CHAPTER 8

Operating Systems and Utility Programs

At last, your chemistry lab is finished. Now you have time to relax and respond to e-mail messages, some of which relate to your distance learning course. As you click the Send button, replying to the first of 22 unread messages, the computer freezes. You click the button on the mouse. Nothing happens. You press a key on the keyboard. The computer beeps. You click the mouse again. Still no response. With reluctance, you restart the computer.

While you are waiting, you ponder the work ahead and hope nothing is wrong. After all, you no longer can get by in school without your computer. By now, you expect to see the Windows desktop. Something *is* wrong. It is time to call for help. You dial the toll-free number for technical support, but the automated system places you on hold. Your thoughts turn to that distance learning homework.

Finally, a live person answers your call! You explain the problem to the technician. She tells you the first step in solving this problem is to start the computer again — this time with the boot disk in the floppy disk drive. Now you know you are in trouble… what's a boot disk?

OBJECTIVES

After completing this chapter, you will be able to:

- Describe the two types of software
- Understand the startup process for a personal computer
- Describe the term user interface
- Explain features common to most operating systems
- Know the difference between stand-alone operating systems and network operating systems
- Identify various stand-alone operating systems
- Identify various network operating systems
- Recognize devices that use embedded operating systems
- Discuss the purpose of the following utilities: file viewer, file compression, diagnostic, uninstaller, disk scanner, disk defragmenter, backup, and screen saver

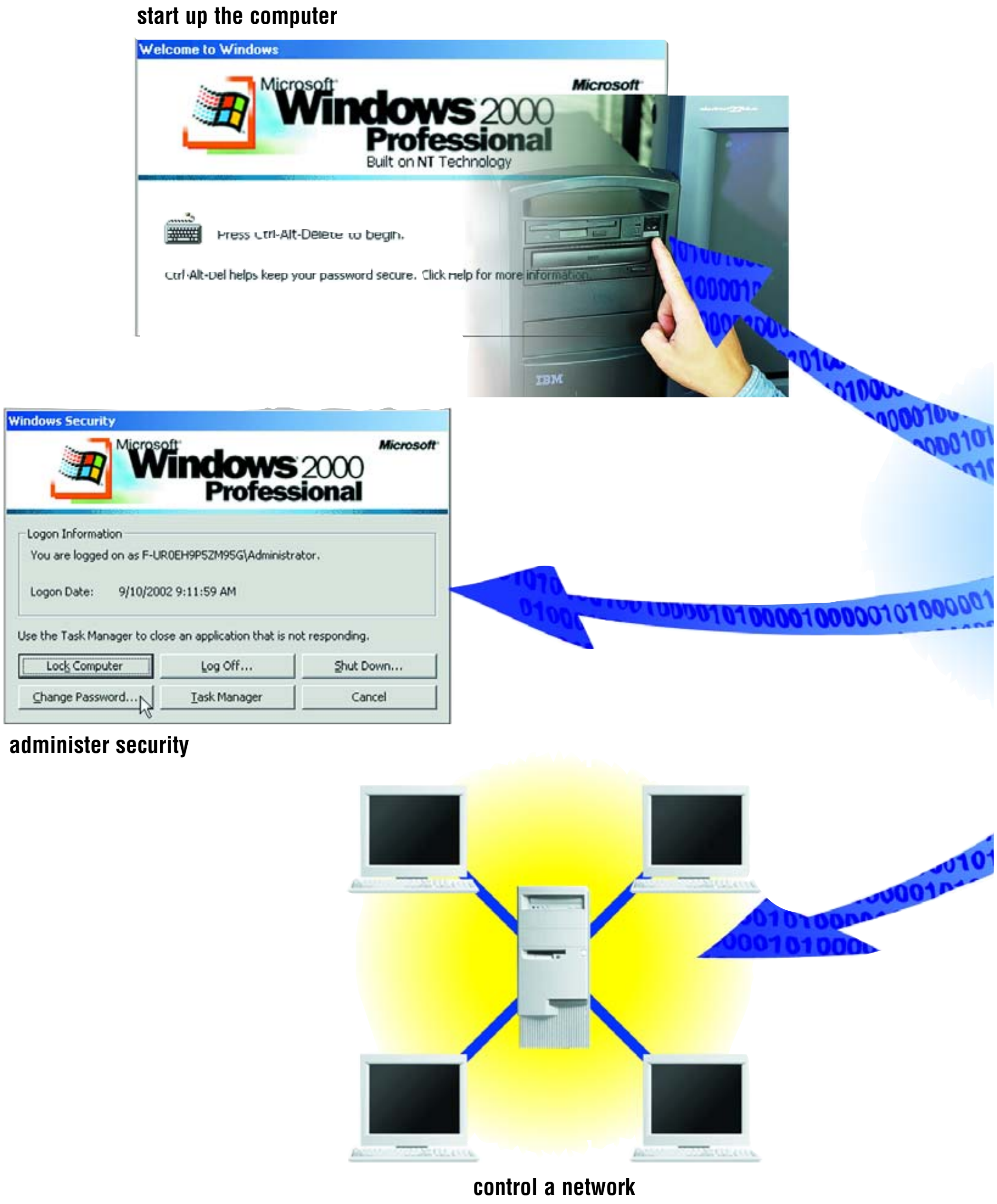
SYSTEM SOFTWARE

Software is the series of computer-language coded instructions that tells the computer how to perform tasks. Two types of software are application software and system software. Like most computer users, you probably interact with a variety of application software products such as a word processing program, an e-mail program, and a Web browser. You also interact with system software.

System software consists of the programs that control the operations of the computer and its devices. System software serves as the interface between the user, the application software, and the computer's hardware.

Two types of system software include operating systems and utility programs. This chapter discusses the operating system and its functions, as well as several utility programs for personal computers.

Figure 8-1 Most operating systems perform the functions illustrated in this figure.



Press Ctrl-Alt-Delete to begin.

Ctrl-Alt-Del helps keep your password secure. Click Help for more information.

You are logged on as F-UR0EH9P5ZM95G\Administrator.

Logon Date: 9/10/2002 9:11:59 AM

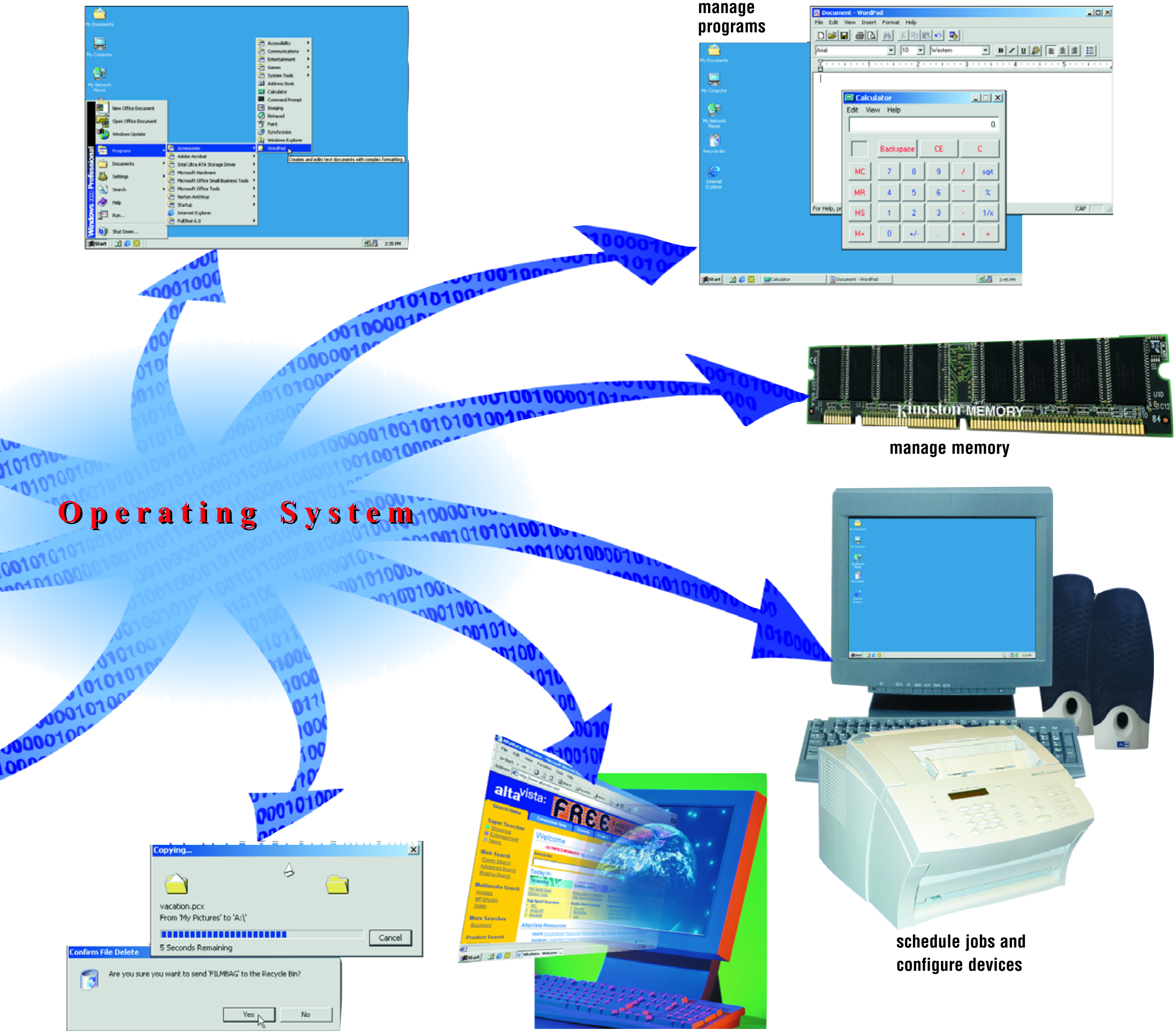
Use the Task Manager to close an application that is not responding.

OPERATING SYSTEMS

An **operating system** (**OS**) is a set of programs containing instructions that coordinate all the activities among computer hardware resources. For example, the operating system recognizes input from an input device such as the keyboard, mouse, microphone, or PC camera; coordinates the display of output on the monitor; instructs a printer how and when to print information; and manages data and instructions in memory and information stored on disk. A computer needs an operating system to work.

Many different operating systems exist. Most perform similar functions that include starting the computer, providing a user interface, managing programs, managing memory, scheduling jobs, configuring devices, accessing the Web, monitoring performance, and providing housekeeping services (Figure 8-1). Some operating systems also allow you to control a network and administer security.

In most cases, the operating system resides on the computer's hard disk. On smaller handheld computers, the operating system may reside on a ROM chip.



vacation.pcx
From 'My Pictures' to 'A:\'
5 Seconds Remaining

Are you sure you want to send 'FILMBAG' to the Recycle Bin?

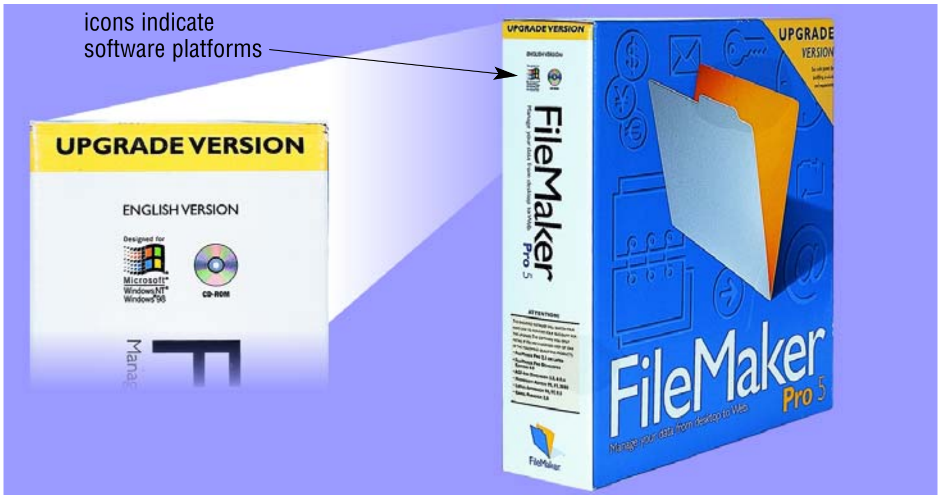


Figure 8-2 Some applications run on multiple software platforms (operating systems). This box shows that FileMaker runs on Windows 98 and Windows NT.

Different sizes of computers typically use different operating systems. For example, a mainframe computer does not use the same operating system as a desktop computer. Even the same types of computers, such as desktop computers, may not use the same operating system. One personal computer may use Windows and another may use Mac OS. Furthermore, these various operating systems often are not compatible with each other. The operating system that runs on a PC will not run on an Apple computer. In addition, application software that works with one operating system may not work with another.

The operating system that a computer uses sometimes is called the **software platform** or **platform**. When you purchase application software, the package identifies the required software platform (operating system). A **cross-platform** application is one that runs identically on multiple operating systems (Figure 8-2). Often, these cross-platform applications have multiple versions, each corresponding to a different operating system.

OPERATING SYSTEM FUNCTIONS

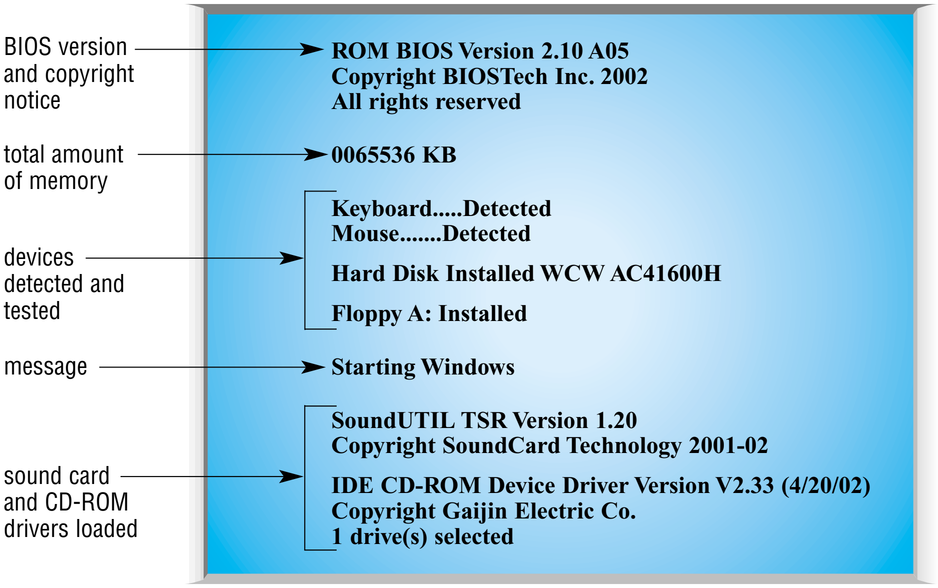
Regardless of the size of computer, most operating systems provide similar functions. The following sections discuss functions common to operating systems.

Starting a Computer

Booting is the process of starting or restarting a computer. When you turn on a computer after it has been powered off completely, you are performing a **cold boot**. A **warm boot** or **warm start** is the process of restarting a computer that already is powered on. When using Windows, for example, you can perform a warm boot by pressing a combination of keyboard keys, selecting options from a menu, or pressing a Reset button on the computer.

Each time you boot a computer, the kernel and other frequently used operating system instructions are *loaded*, or copied from the hard disk (storage) to the computer's memory (RAM). The **kernel** is the core of an operating system that manages memory and devices; maintains the computer's clock; starts applications; and assigns the computer's resources, such as devices, programs, data, and information. The kernel is **memory resident**, which means it remains in memory while the computer is running. Other parts of the operating system are **nonresident**, which means their instructions remain on the hard disk until they are needed.

When you boot a computer, a set of messages displays on the screen (Figure 8-3). The actual information


BIOS version and copyright notice
total amount of memory
devices detected and tested
message
sound card and CD-ROM drivers loaded

```
ROM BIOS Version 2.10 A05
Copyright BIOSTech Inc. 2002
All rights reserved

0065536 KB

Keyboard.....Detected
Mouse.......Detected

Hard Disk Installed WCW AC41600H

Floppy A: Installed

Starting Windows

SoundUTIL TSR Version 1.20
Copyright SoundCard Technology 2001-02

IDE CD-ROM Device Driver Version V2.33 (4/20/02)
Copyright Gaijin Electric Co.
1 drive(s) selected
```

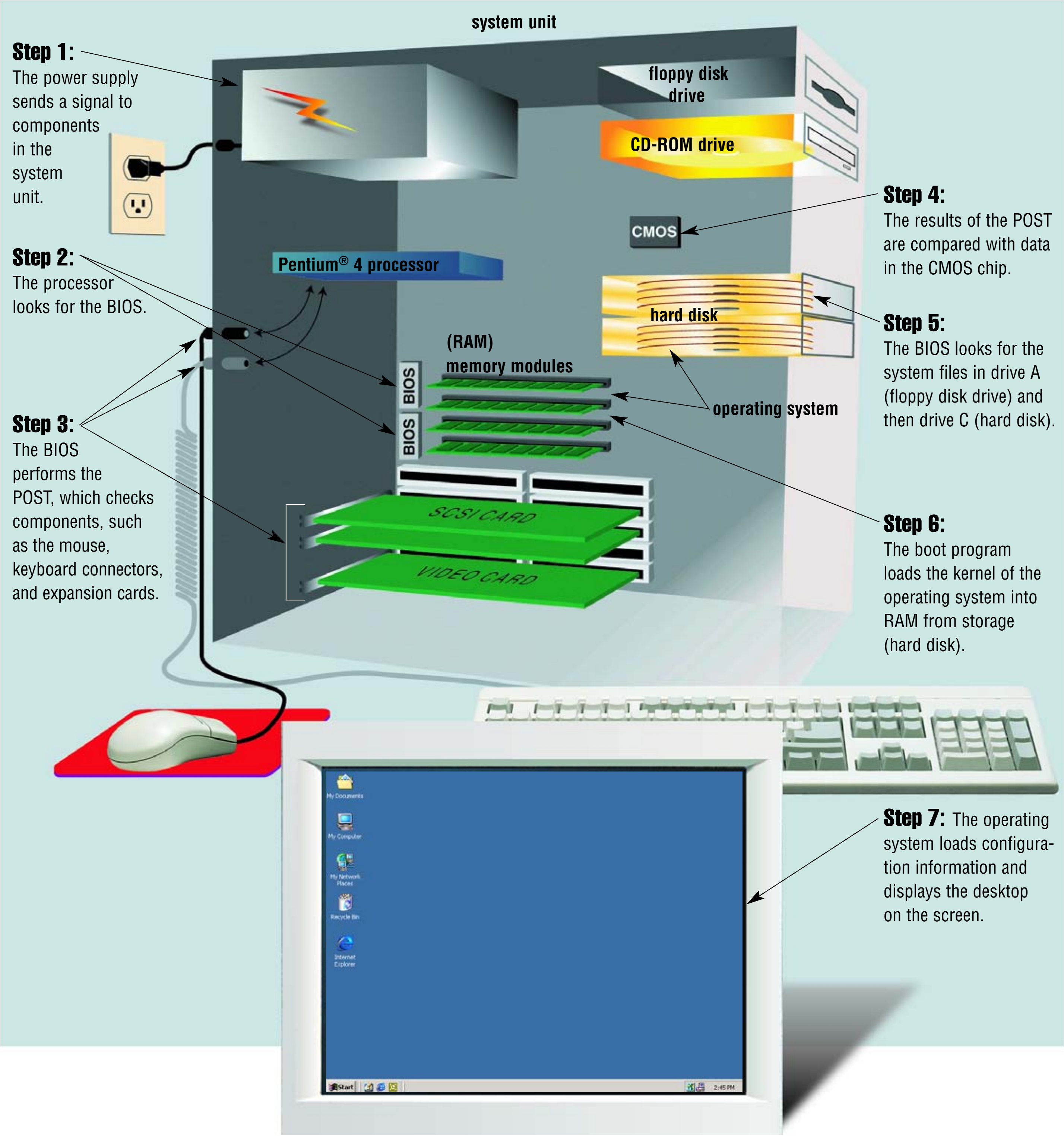
Figure 8-3 When you boot a computer, a set of messages displays on the screen. The actual information displayed varies depending on the make of the computer and the equipment installed.

displayed varies depending on the make of the computer and the equipment installed. The boot process, however, is similar for large and small computers.

The following steps explain what occurs during a cold boot on a personal computer using the Windows operating system (Figure 8-4).

1. When you turn on the computer, the power supply sends an electrical signal to the motherboard and the other devices located in the system unit.
2. The surge of electricity causes the processor chip to reset itself and look for the ROM chip(s) that contains the BIOS. The **BIOS** (pronounced BYE-ohss), which stands for **basic input/output system**, is firmware that contains the computer's startup instructions.

Figure 8-4 HOW A PERSONAL COMPUTER BOOTS UP



Step 1: The power supply sends a signal to components in the system unit.

Step 2: The processor looks for the BIOS.

Step 3: The BIOS performs the POST, which checks components, such as the mouse, keyboard connectors, and expansion cards.

Step 4: The results of the POST are compared with data in the CMOS chip.

Step 5: The BIOS looks for the system files in drive A (floppy disk drive) and then drive C (hard disk).

Step 6: The boot program loads the kernel of the operating system into RAM from storage (hard disk).

Step 7: The operating system loads configuration information and displays the desktop on the screen.

As discussed in Chapter 4, firmware consists of ROM chips that contain permanently written instructions.

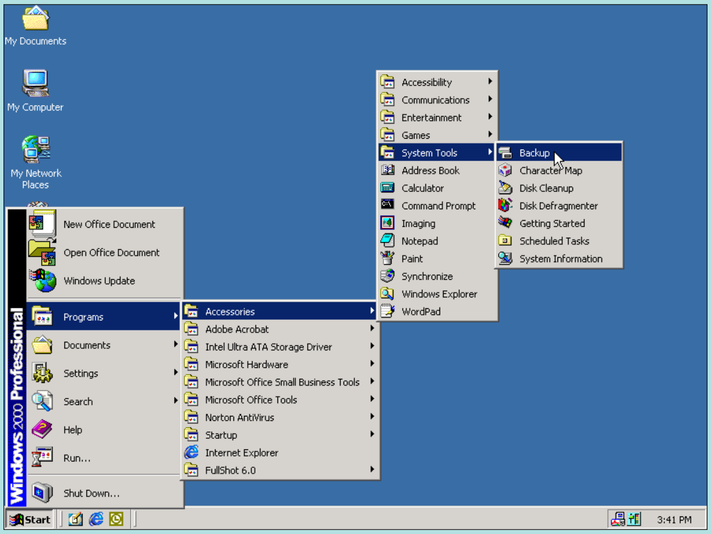
3. The BIOS executes a series of tests to make sure the computer hardware is connected properly and operating correctly. The tests, collectively called the **power-on self test** (**POST**), check the various system components such as the buses, system clock, expansion cards, RAM chips, keyboard, and drives. As the POST executes, LEDs flicker on devices, including the disk drives and keyboard. Several beeps also sound, and messages display on the monitor's screen.
4. The POST results are compared with data in a CMOS chip on the motherboard. As discussed in Chapter 4, the CMOS chip stores configuration information about the computer, such as the amount of memory; type of disk drives, keyboard, and monitor; the current date and time; and other startup information. It also detects any new devices connected to the computer. If any problems are found, the computer may beep, display error messages, or cease operating — depending on the severity of the problem.
5. If the POST completes successfully, the BIOS searches for specific operating system files called **system files**. Usually, the operating system will look first in drive A (the designation for a floppy disk drive). If the system files are not on a disk in drive A, the BIOS looks in drive C (the designation usually given to the first hard disk). If neither drive A nor drive C contain the system files, some computers look to the CD-ROM or DVD-ROM drive.
6. Once located, the system files load into memory and execute. Next, the kernel of the operating system loads into memory. Then, the operating system in memory takes control of the computer.
7. The operating system loads system configuration information. In Windows, the **registry** consists of several files that contain the system configuration information. Windows constantly accesses the registry during the computer's operation for information such as installed hardware and software devices and individual user preferences for mouse speed, passwords, and other user-specific information.

Necessary operating system files load into memory. When complete, the Windows desktop and icons display on the screen. The operating system executes programs in the StartUp folder. The **StartUp folder** contains a list of programs that open automatically when you boot the computer.

EMERGENCY REPAIR DISK A **boot drive** is the drive from which your personal computer boots (starts). In most cases, drive C (the hard disk) is the boot drive. Sometimes a hard disk becomes damaged and the computer cannot boot from the hard disk. In this case, you can boot from a special disk. An **emergency repair disk**, sometimes called a **boot disk** or a **rescue disk**, is a floppy disk, Zip® disk, or CD-ROM that contains system files that will start the computer. For this reason, it is crucial you have an emergency repair disk available and ready for use.

When you install an operating system, one of the installation steps involves making an emergency repair disk. Often when you purchase a computer, the manufacturer pre-installs the operating system. If you did not install the operating system, you may not have an emergency repair disk. In this case, you should create one and keep it in a safe place. The steps in Figure 8-5 show how to create an emergency repair disk in Windows.

Figure 8-5 HOW TO CREATE AN EMERGENCY REPAIR DISK IN WINDOWS



Step 1:

Click the Start button on the taskbar, point to Programs on the Start menu, point to Accessories on the Programs submenu, point to System Tools on the Accessories submenu, and then point to Backup.

The User Interface

You interact with software through its user interface. A **user interface** controls how you enter data and instructions and how information displays on the screen. Two types of user interfaces are command-line and graphical (Figure 8-6). Many operating systems use a combination of these two interfaces to define how you interact with your computer.

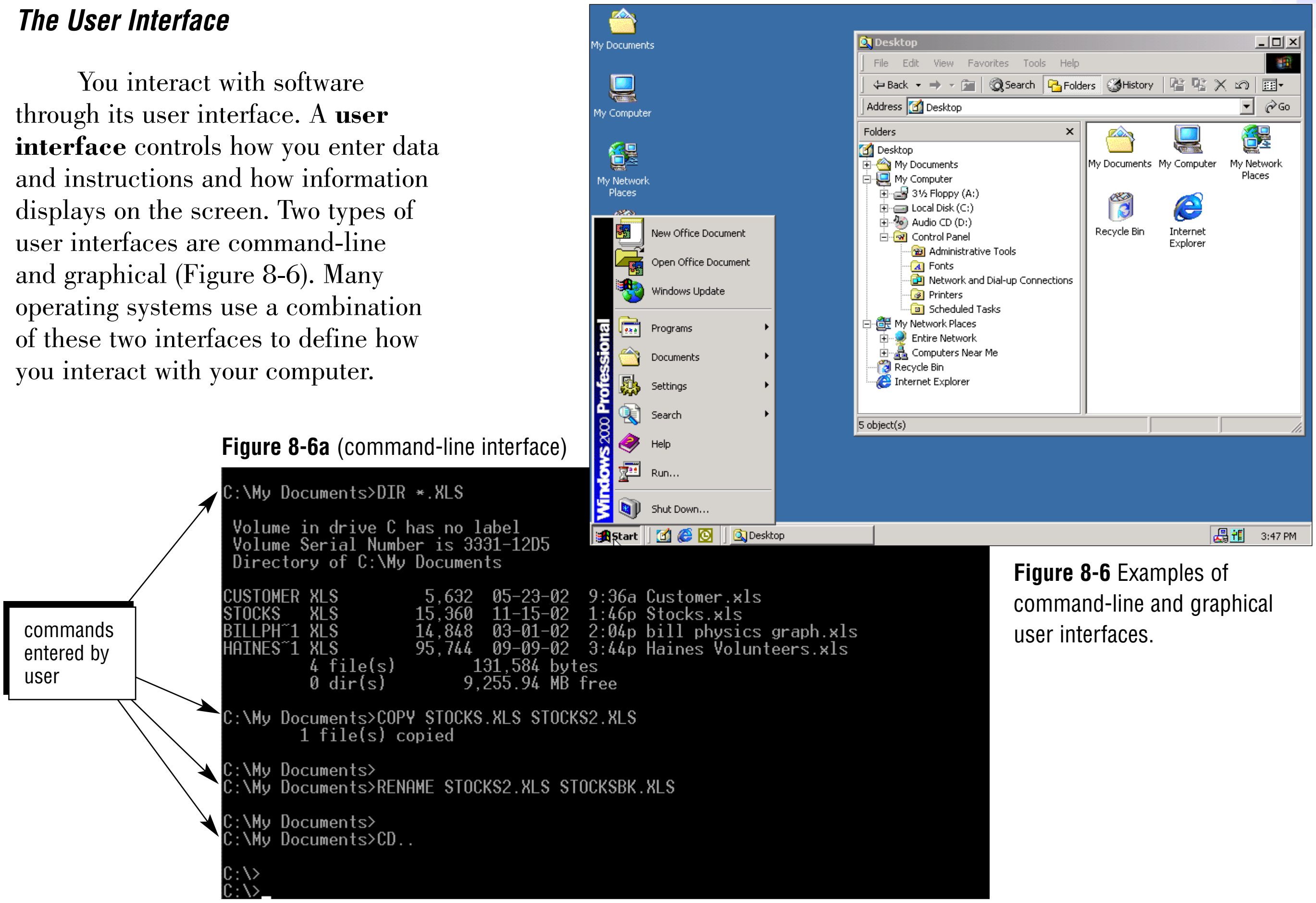
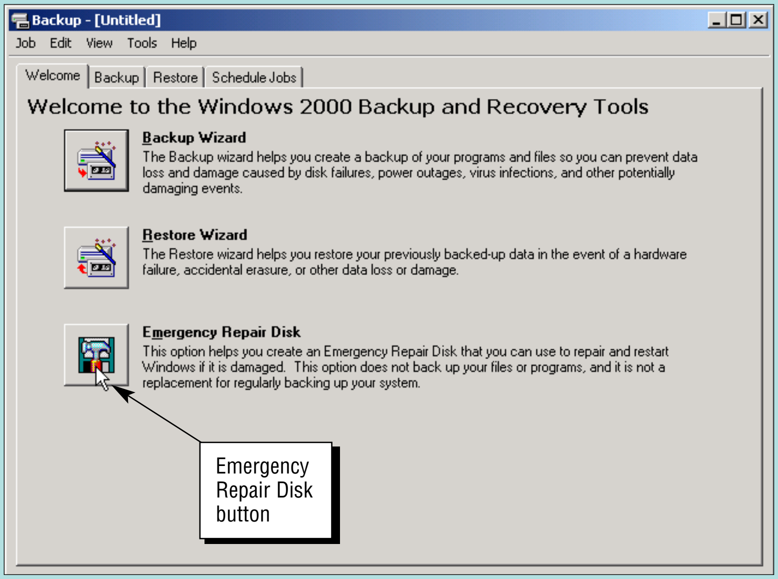


Figure 8-6b (graphical user interface)

Figure 8-6a (command-line interface)

```
C:\My Documents>DIR *.XLS

 Volume in drive C has no label
 Volume Serial Number is 3331-12D5
 Directory of C:\My Documents

CUSTOMER XLS         5,632  05-23-02   9:36a Customer.xls
STOCKS   XLS        15,360  11-15-02   1:46p Stocks.xls
BILLPH~1 XLS        14,848  03-01-02   2:04p bill physics graph.xls
HAINES~1 XLS        95,744  09-09-02   3:44p Haines Volunteers.xls
         4 file(s)        131,584 bytes
         0 dir(s)        9,255.94 MB free

C:\My Documents>COPY STOCKS.XLS STOCKS2.XLS
        1 file(s) copied

C:\My Documents>
C:\My Documents>RENAME STOCKS2.XLS STOCKSBK.XLS

C:\My Documents>
C:\My Documents>CD..

C:\>
C:\>_
```

Figure 8-6 Examples of command-line and graphical user interfaces.

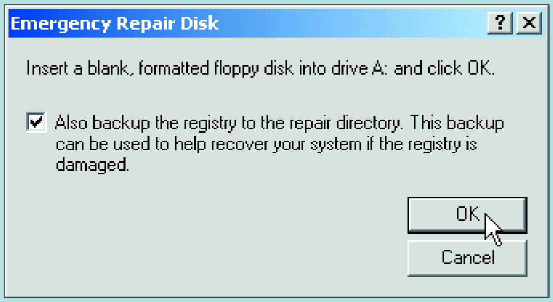


Welcome to the Windows 2000 Backup and Recovery Tools

Backup Wizard
The Backup wizard helps you create a backup of your programs and files so you can prevent data loss and damage caused by disk failures, power outages, virus infections, and other potentially damaging events.

Restore Wizard
The Restore wizard helps you restore your previously backed-up data in the event of a hardware failure, accidental erasure, or other data loss or damage.

Emergency Repair Disk
This option helps you create an Emergency Repair Disk that you can use to repair and restart Windows if it is damaged. This option does not back up your files or programs, and it is not a replacement for regularly backing up your system.



Insert a blank, formatted floppy disk into drive A: and click OK.

☑ Also backup the registry to the repair directory. This backup can be used to help recover your system if the registry is damaged.

Step 2:
Click Backup on the System Tools submenu to open the Backup window. Point to the Emergency Repair Disk button.

Step 3:
Click the Emergency Repair Disk button to create the emergency repair disk. Follow the on-screen instructions.

With a **command-line interface**, you type keywords or press special keys on the keyboard to enter data and instructions. As described in Chapter 3, a keyword is a special word, phrase, or code that a program understands as an instruction. Some keyboards also include keys that send a command to a program when you press them. When working with a command-line interface, the set of commands you use to interact with the computer is called the **command language**. Command-line interfaces often are difficult to use because they require exact spelling, grammar, and punctuation. Minor errors, such as a missing period, will generate an error message.

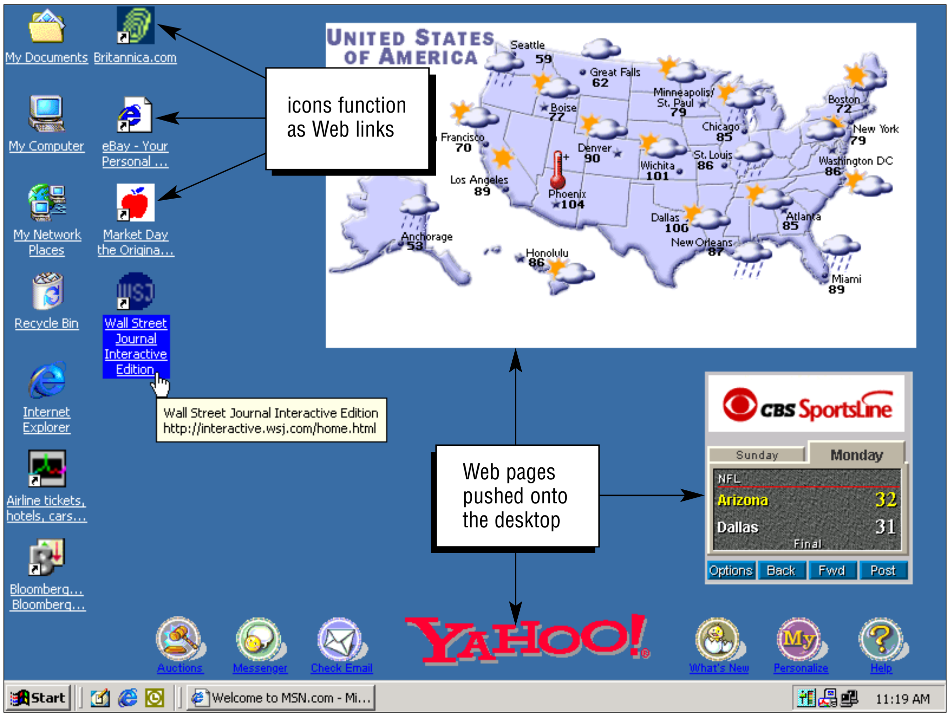
A graphical user interface typically is easier to learn and use than a command-line interface because it does not require you memorize a command language. As discussed in Chapter 1, a **graphical user interface** (**GUI**) allows you to use menus and visual images such as icons, buttons, and other graphical objects to issue commands. A **menu** is a set of commands from which you choose. An **icon** is a small image that represents a program, an instruction, a file, or some other object. You can use a keyboard, mouse, or any other pointing device to interact with menus, icons, buttons, and other onscreen objects.

Today, many GUIs incorporate features similar to that of a Web browser. For example, icons function as Web links, and Web pages can be delivered or *pushed* automatically to your screen (Figure 8-7).

Managing Programs

Some operating systems have single-user functionality and can support only one running program. Others support thousands of users running multiple programs. How an operating system handles programs directly affects your productivity.

A **single user/single tasking** operating system allows only one user to run one program at a time. Suppose, for example, you are creating a poster in a graphics program and then decide to check your e-mail messages. With a single tasking operating system, you must quit the graphics program before you can run the e-mail program. You then must close the e-mail program and restart the graphics program to finish the poster. Early systems were single user. Most operating systems today are multitasking.



icons function as Web links

Web pages pushed onto the desktop

Figure 8-7 This graphical user interface incorporates icons that function like Web links, and Web pages that are *pushed* onto the desktop.

ISSUE

OS Innovations

Types of Operating Systems

Today's operating systems include a variety of features. They support a graphical user interface, monitor performance, and administer security. Most operating systems also include a variety of utility programs. These utilities offer functions such as compressing files, diagnosing problems, scanning disks, defragmenting disks, checking for viruses, backing up files and disks, and displaying screen savers. Do you think an operating system should include these features? Are these features useful? What other features should be included in an operating system? If you were to write an overview of the perfect operating system, which innovative features would you include?

For more information on operating systems and operating systems features, visit the Discovering Computers 2002 Issues Web page (**scsite.com/dc2002/issues.htm**) and click Chapter 8 Issue #1.

A **multitasking** operating system allows a single user to work on two or more applications that reside in memory at the same time. Using the example just cited, if you are working with a multitasking operating system, you do not have to quit the graphics program to run your e-mail program. Both programs can run concurrently.

Most users today run multiple programs simultaneously. It is common to have an e-mail program and Web browser open at all times, while working in applications such as word processing or graphics.

When you run multiple applications at the same time, one is in the foreground and others are in the background (Figure 8-8). The **foreground** contains the active application; that is, the one you currently are using. The others that are running, but not in use, are in the **background**. You easily can switch between foreground and background applications. To make an application active (in the foreground), you click its name on the taskbar. This causes the operating system to place all other applications in the background.

A **multiuser** operating system enables two or more users to run a program simultaneously. Networks, mid-range servers, mainframes, and supercomputers allow hundreds to thousands of users to connect at the same time, and thus are multiuser.

A **multiprocessing** operating system can support two or more processors running programs at the same time. Multiprocessing works much like parallel processing, which was discussed in Chapter 3. Multiprocessing involves the coordinated processing of programs by more than one processor. As with parallel processing, multi-processing increases a computer's processing speed.

A computer with separate processors also can serve as a fault-tolerant computer. A **fault-tolerant computer** continues to operate even if one of its components fails. Fault-tolerant computers have duplicate components such as processors, memory, and disk drives. If any one of these components fails, the computer switches to the duplicate component and continues to operate. Airline reservation systems, communications networks, and automated teller machines and other systems that must be operational at all times use fault-tolerant computers.

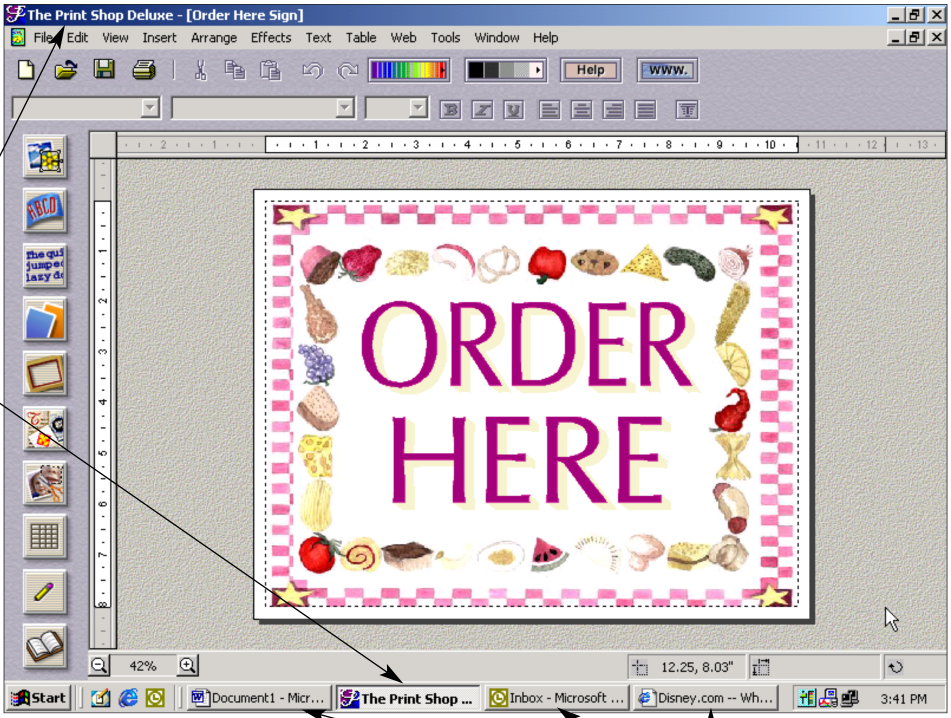

The Print Shop Deluxe - [Order Here Sign]
File Edit View Insert Arrange Effects Text Table Web Tools Window Help
Help
WWW.
ORDER
HERE
42%
12.25, 8.03"
Start
Document1 - Micr...
The Print Shop ...
Inbox - Microsoft ...
Disney.com -- Wh...
3:41 PM
foreground application
background applications listed on the taskbar

Figure 8-8 The Print Shop is in the foreground. Microsoft Word, Outlook, and Internet Explorer are in the background.

Managing Memory

The purpose of **memory management** is to optimize use of random access memory (RAM). As discussed in Chapter 4, RAM consists of one or more chips on the motherboard that temporarily hold items such as data and instructions while the processor interprets and executes them. The operating system allocates, or assigns, these items to an area of memory while they are being processed. Then, it carefully monitors the contents of memory. Finally, the operating system clears these items from memory when the processor no longer requires them.

Some operating systems use virtual memory to optimize RAM. With **virtual memory** (**VM**), the operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM (Figure 8-9). As you interact with a program, part of it may be in RAM, while the rest of the program is on the hard disk as virtual memory.

The area of the hard disk used for virtual memory is called a **swap file** because it swaps (exchanges) data, information, and instructions between memory and storage. A **page** is the amount of data and program instructions that can swap at a given time. Thus, the technique of swapping items between memory and storage often is called **paging**.

When an operating system spends much of its time paging, instead of executing application software, it is said to be **thrashing**. If application software, such as a Web browser, has stopped responding and your hard disk's LED blinks repeatedly, the operating system probably is thrashing. To stop it from thrashing, quit the application that stopped responding. If thrashing occurs frequently, one possibility is you may need to install more RAM in your computer.

Scheduling Jobs

The operating system determines the order in which jobs are processed. A **job** is an operation the processor manages. Jobs include receiving data from an input device, processing

VIRTUAL MEMORY MANAGEMENT

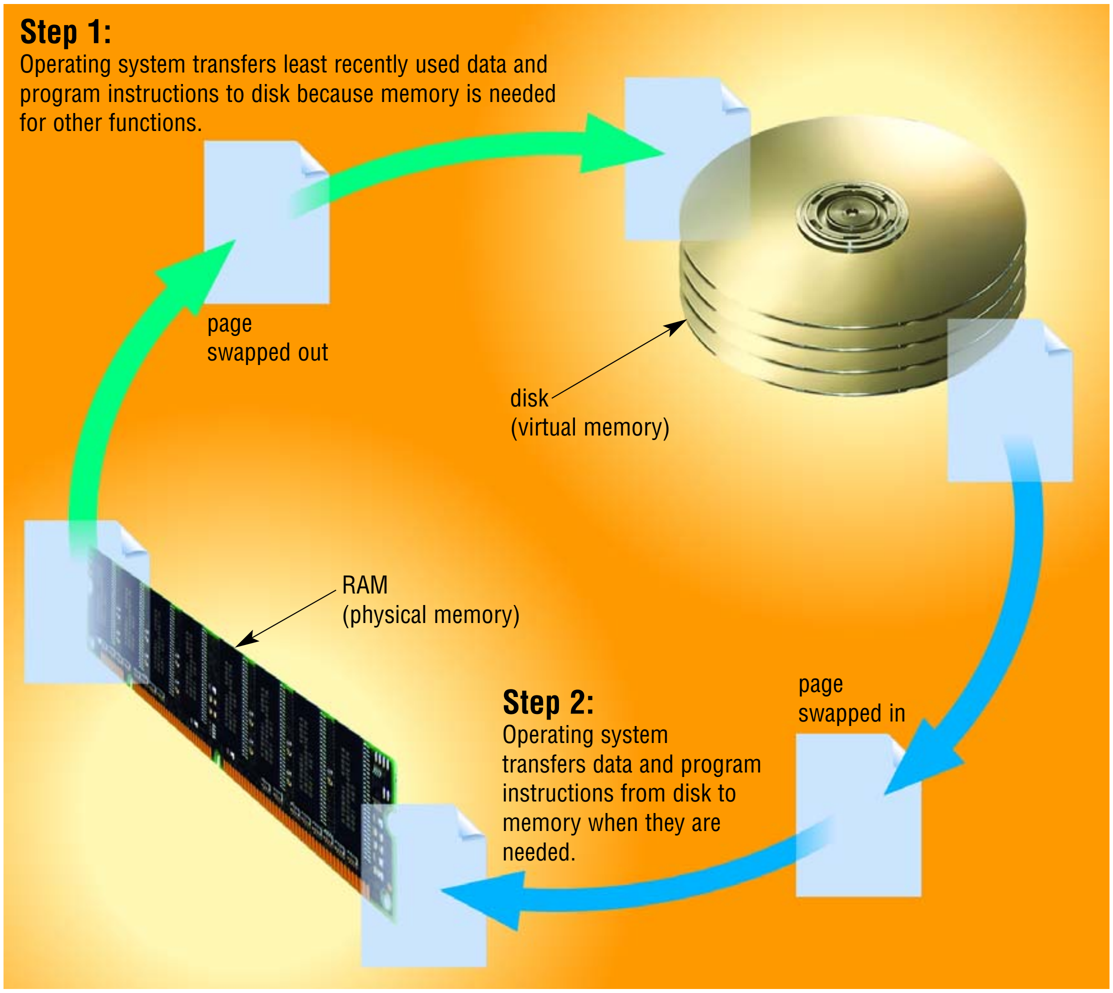

Step 1:
Operating system transfers least recently used data and program instructions to disk because memory is needed for other functions.
page swapped out
disk (virtual memory)
RAM (physical memory)
Step 2:
Operating system transfers data and program instructions from disk to memory when they are needed.
page swapped in

Figure 8-9 With virtual memory (VM), the operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM. As you interact with a program, part of it may be in RAM, while the rest of the program is on the hard disk as virtual memory.

instructions, sending information to an output device, and transferring items from storage to memory and from memory to storage.

The operating system does not always process jobs on a first-come, first-served basis. Sometimes, one user may have higher priority than other users. In this case, the operating system has to adjust the schedule of jobs. Other times, a device may already be busy processing one job when it receives another job. This occurs because the processor operates at a much faster rate of speed than peripheral devices. For example, if the processor sends five print jobs to a printer, the printer only can print one document at a time.

While waiting for devices to become idle, the operating system places items in buffers. A **buffer** is an area of memory or storage in which items are placed while waiting to be transferred to or from an input or output device.

The operating system commonly uses buffers with print jobs. This process, called **spooling,** sends print jobs to a buffer instead of sending them immediately to the printer. The buffer holds the information waiting to print while the printer prints from the buffer at its own speed. By spooling print jobs to a buffer, the processor can interpret and execute instructions while the printer is printing documents. Once a print job is in the buffer, you can use the computer for other tasks.

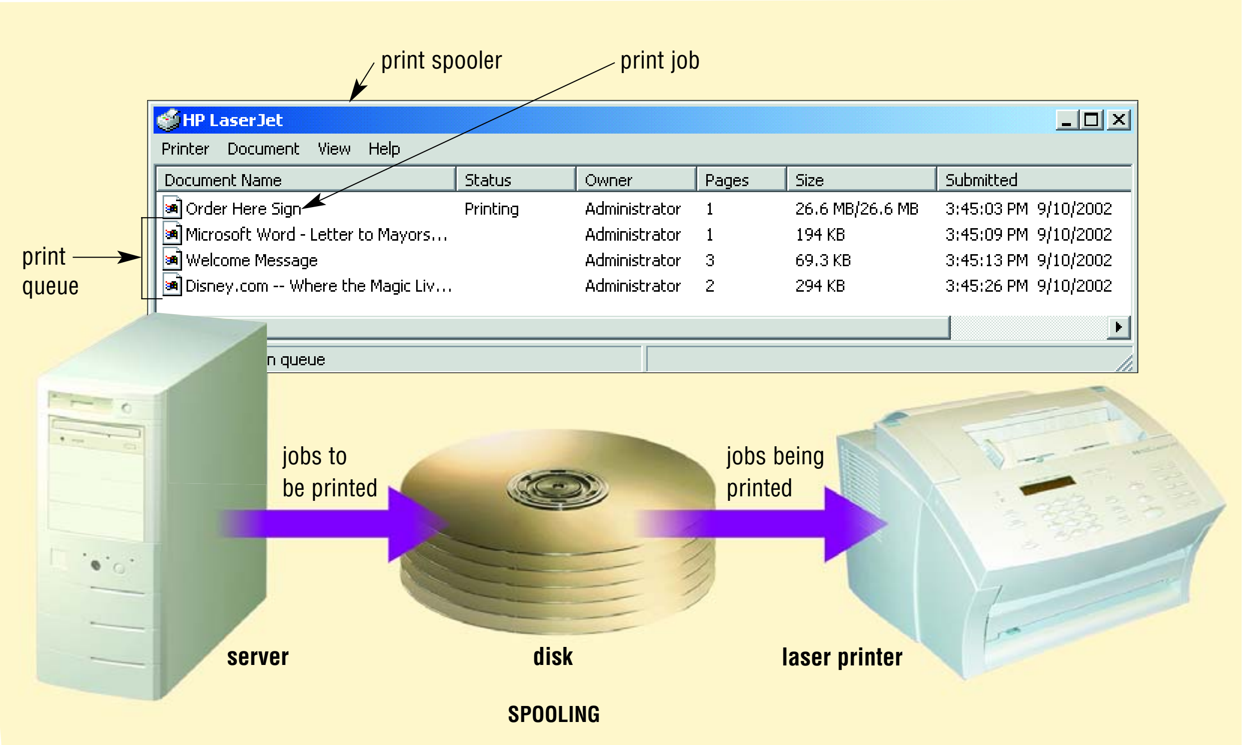
Another advantage of spooling is it allows you to send a second job to the printer without waiting for the first job to finish printing. Multiple print jobs line up in a **queue** within the buffer. A program, called a **print spooler**, intercepts print jobs from the operating system and places them in the queue (Figure 8-10).

Configuring Devices

To communicate with each device in the computer, the operating system relies on device drivers. A **device driver**, also called a **driver**, is a small program that tells the operating system how to communicate with a device. Each device on a computer, such as the mouse, keyboard, monitor, and printer, has its own specialized set of commands and thus requires its own specific driver. When you boot a computer, the operating system loads each device's driver. These devices will not function without their correct drivers. In Windows environments, most device drivers have a .drv extension.

Web Link

For more information on device drivers, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click Device Drivers.



Document Name	Status	Owner	Pages	Size	Submitted
Order Here Sign	Printing	Administrator	1	26.6 MB/26.6 MB	3:45:03 PM 9/10/2002
Microsoft Word - Letter to Mayors...		Administrator	1	194 KB	3:45:09 PM 9/10/2002
Welcome Message		Administrator	3	69.3 KB	3:45:13 PM 9/10/2002
Disney.com -- Where the Magic Liv...		Administrator	2	294 KB	3:45:26 PM 9/10/2002

Figure 8-10 Spooling increases both processor and printer efficiency by writing print jobs to a disk before they are printed. In this figure, three jobs are in the queue and one is printing.

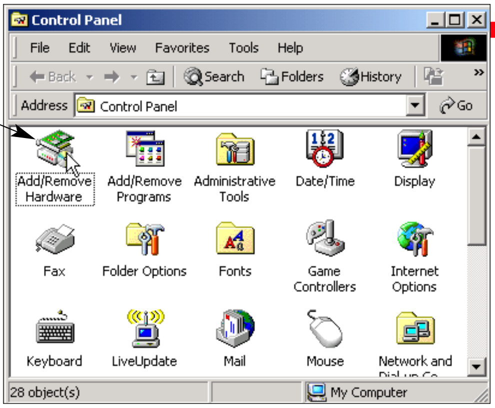
If you attach a new device to your computer, such as a printer or scanner, its driver must be installed before you can use the device. Windows provides a wizard to guide you through the installation steps. Figure 8-11 shows how to install a device driver for a Kodak digital camera. You follow the same general steps to install device drivers for any type of hardware. For many devices, your computer's operating system already may include the necessary drivers. If it does not, you can install the drivers from the disk included with the device upon purchase.

If you need a driver for your device and do not have the original disk, you can obtain the driver by contacting the vendor that sold you the device or contacting the manufacturer directly. Many manufacturers post device drivers on their Web site for anyone to download.

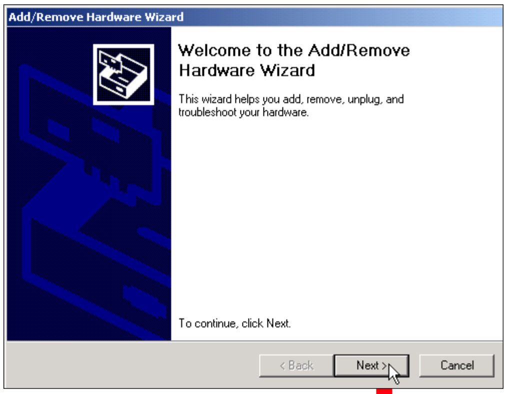
Figure 8-11 HOW TO INSTALL DRIVERS FOR NEW HARDWARE IN WINDOWS

Add/Remove Hardware icon

Step 1:
Open the Control Panel window. Point to the Add/Remove Hardware icon.



Step 2:
Start the Add/Remove Hardware Wizard by double-clicking the Add/Remove Hardware icon. Follow the on-screen instructions.

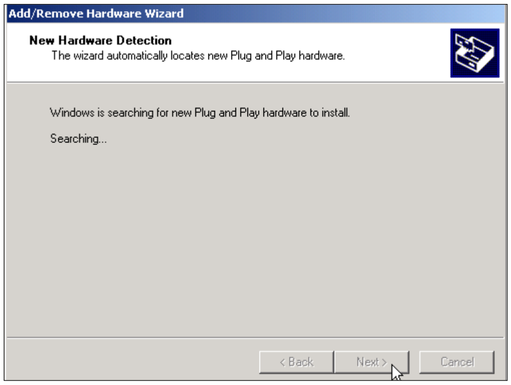


Welcome to the Add/Remove Hardware Wizard

This wizard helps you add, remove, unplug, and troubleshoot your hardware.

To continue, click Next.

Step 3:
The Add/Remove Hardware Wizard searches for Plug and Play devices on your system. If it finds any such devices, it installs them.

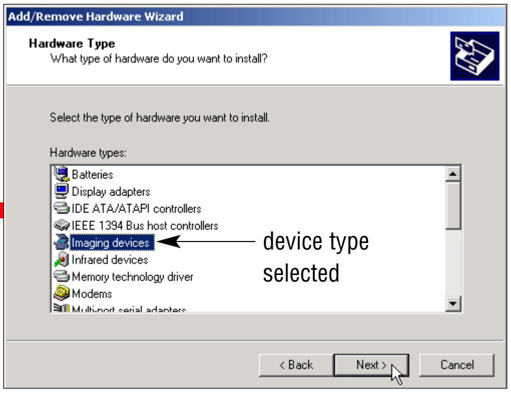


New Hardware Detection
The wizard automatically locates new Plug and Play hardware.

Windows is searching for new Plug and Play hardware to install.

Searching...

Step 4:
If the Add/Remove Hardware Wizard cannot find any Plug and Play devices, you can select the type of device you want to install.


Add/Remove Hardware Wizard
Batteries
Display adapters
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Imaging devices
Infrared devices
Memory technology driver
Modems
Multi-port serial adapters
< Back
Next >
Cancel

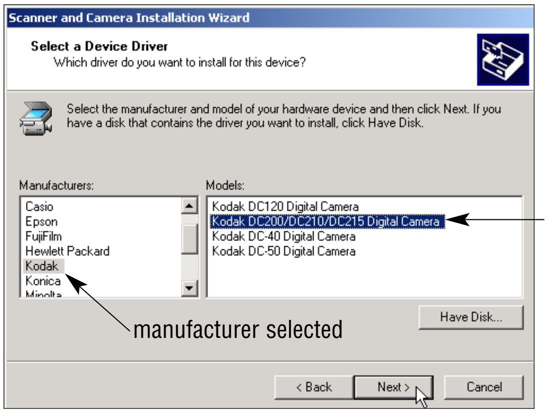
Hardware Type
What type of hardware do you want to install?

Select the type of hardware you want to install.

Hardware types: Imaging devices

device type selected

Step 5:
Next, you select the manufacturer and model you want to install. You may be requested to insert the floppy disk, CD-ROM, or DVD-ROM that contains necessary driver files to complete the installation of the device.


Scanner and Camera Installation Wizard
Casio
Epson
FujiFilm
Hewlett Packard
Kodak
Konica
Minolta
Kodak DC120 Digital Camera
Kodak DC200/DC210/DC215 Digital Camera
Kodak DC-40 Digital Camera
Kodak DC-50 Digital Camera
Have Disk...
< Back
Next >
Cancel

Select a Device Driver
Which driver do you want to install for this device?

Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

Manufacturers: Kodak

Models: Kodak DC200/DC210/DC215 Digital Camera

model selected

manufacturer selected

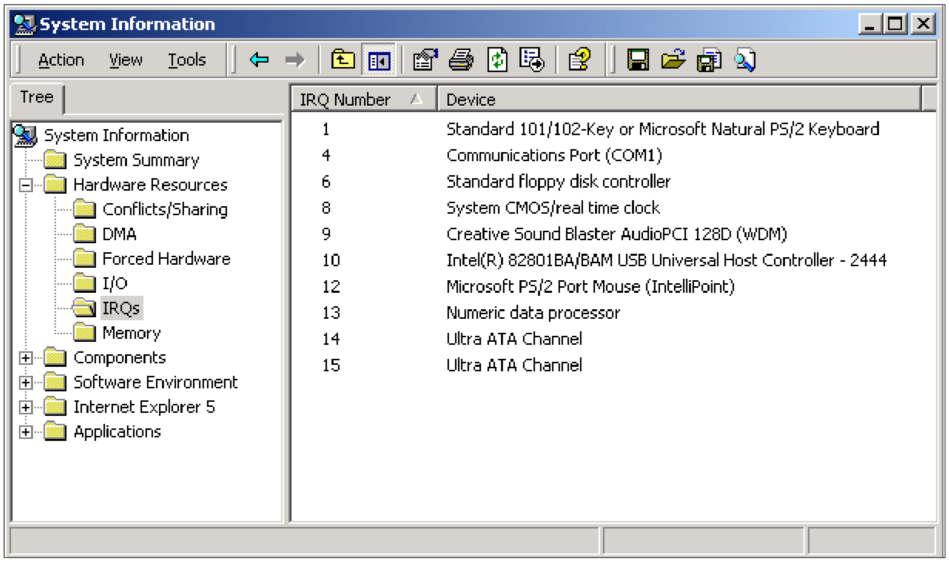
In the past, installing a new hardware device often required setting switches and other elements on the motherboard. Today, installation is easier because most devices and operating systems support Plug and Play. As discussed in Chapter 4, **Plug and Play** means the computer can recognize a new device and assist you in its installation by loading the necessary drivers automatically and checking for conflicts with other devices. With Plug and Play, a user can plug in a device, turn on the computer, and then use, or play, the device without having to configure the system manually.

When installing some components, occasionally you have to know which interrupt request the device should use for communications. An **interrupt request** (**IRQ**) is a communications line between a device and the processor. Most computers have 16 IRQs, numbered 0 through 15 (Figure 8-12). With Plug and Play, the operating system determines the best IRQ to use for these communications. If your operating system uses an IRQ that already is assigned to another device, an IRQ conflict will occur and the computer will not work properly. If an IRQ conflict occurs, you will have to obtain the correct IRQ for the device. You usually can find this information in the installation directions that accompany the device.

Accessing the Web

Operating systems typically provide a means to establish Web connections. For example, Windows includes an Internet Connection Wizard that guides you through the process of setting up a connection between your computer and your Internet service provider (Figure 8-13).

Some operating systems include a Web browser and an e-mail program, enabling you to begin using the Web and communicate with others as soon as you set up the connections. This feature saves time because you do not have to install any additional software.

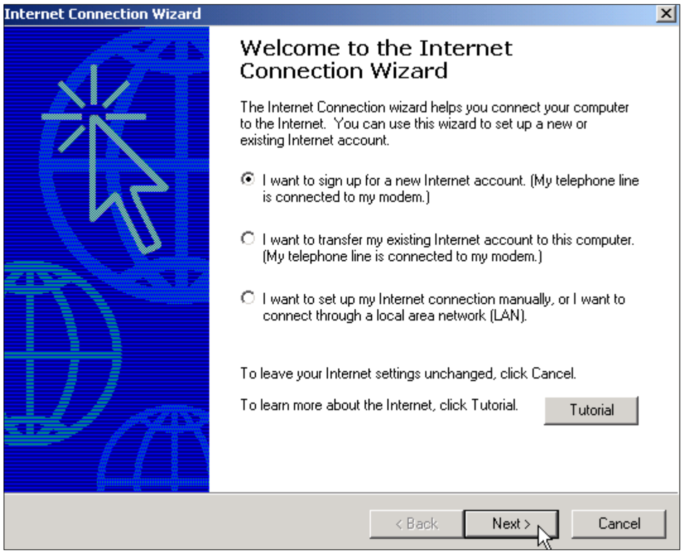


IRQ Number	Device
1	Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
4	Communications Port (COM1)
6	Standard floppy disk controller
8	System CMOS/real time clock
9	Creative Sound Blaster AudioPCI 128D (WDM)
10	Intel(R) 82801BA/BAM USB Universal Host Controller - 2444
12	Microsoft PS/2 Port Mouse (IntelliPoint)
13	Numeric data processor
14	Ultra ATA Channel
15	Ultra ATA Channel

Figure 8-12 An interrupt request (IRQ) is a communication line between a device and the processor. In this example, only 10 of the 16 IRQs are being used (1, 4, 6, 8, 9, 10, 12, 13, 14, and 15).

Web Link

For more information on Plug and Play, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click Plug and Play.



Welcome to the Internet Connection Wizard

The Internet Connection wizard helps you connect your computer to the Internet. You can use this wizard to set up a new or existing Internet account.

● I want to sign up for a new Internet account. (My telephone line is connected to my modem.)

○ I want to transfer my existing Internet account to this computer. (My telephone line is connected to my modem.)

○ I want to set up my Internet connection manually, or I want to connect through a local area network (LAN).

To leave your Internet settings unchanged, click Cancel.

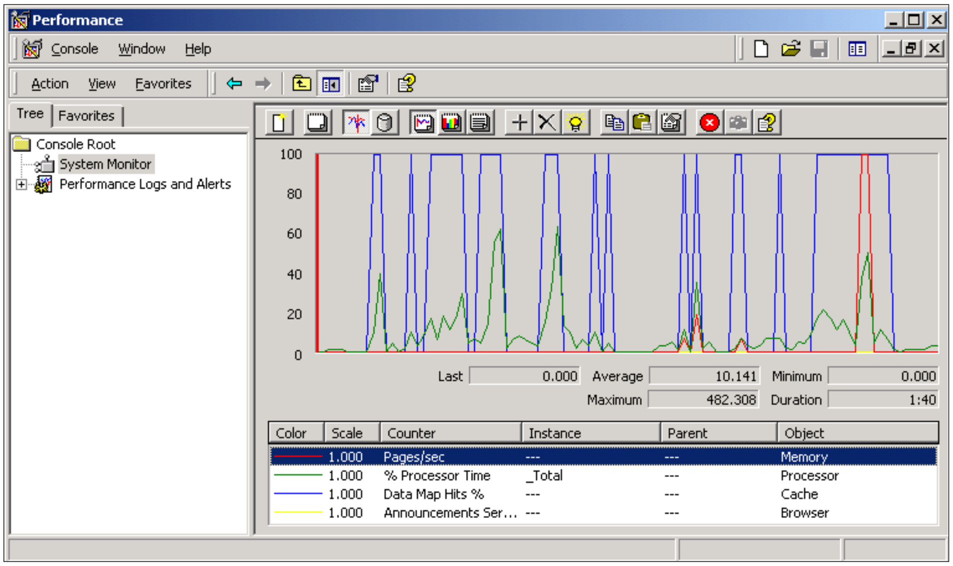
To learn more about the Internet, click Tutorial.

Figure 8-13 The Internet Connection Wizard allows you to set up a connection between your computer and your Internet service provider.

Monitoring Performance

Operating systems typically contain a performance monitor. A **performance monitor** is a program that assesses and reports information about various system resources and devices (Figure 8-14). For example, you can monitor the processor, disks, memory, and network usage. A performance monitor also can check the number of reads and writes to a file.

The information in performance reports can help you identify problems with resources so you can attempt to resolve the problem. If your computer is running extremely slow, the performance monitor may determine that you are using the computer's memory to its maximum. Thus, you might consider installing additional memory.



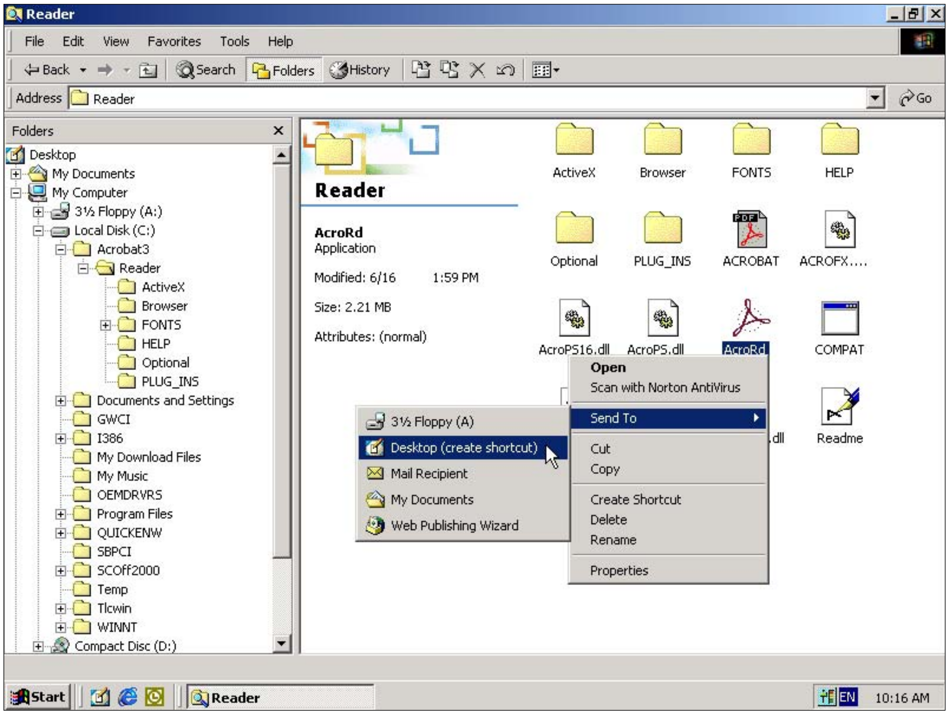
Last 0.000 Average 10.141 Minimum 0.000
Maximum 482.308 Duration 1:40

Color	Scale	Counter	Instance	Parent	Object
🟥	1.000	Pages/sec	---	---	Memory
🟩	1.000	% Processor Time	_Total	---	Processor
🟦	1.000	Data Map Hits %	---	---	Cache
🟨	1.000	Announcements Ser…	---	---	Browser

Figure 8-14 A performance monitor is a program that assesses and reports information about various system resources and devices. The System Monitor is a performance monitor in Windows. Shown above it is tracking memory, processor, cache, and browser usage.

Providing Housekeeping Services

Operating systems contain a program called a file manager. A **file manager** performs functions related to storage and file management (Figure 8-15). Some of the storage and file management functions that a file manager performs are formatting and copying disks; displaying a list of files on a storage medium; checking the amount of used or free space on a storage medium; organizing, copying, renaming, deleting, moving, and sorting files; and creating shortcuts. A **shortcut** is an icon on the desktop that runs a program when you click it.



AcroRd
Application

Modified: 6/16 1:59 PM

Size: 2.21 MB

Attributes: (normal)

Figure 8-15 Shown here is Windows Explorer, which is a file manager included with Windows. In this figure, the user is creating a shortcut for the Acrobat Reader program. The shortcut will display as an icon on the desktop.

Formatting is the process of preparing a disk for reading and writing. Most floppy and hard disk manufacturers preformat their disks. If you must format a floppy disk, do so by issuing a formatting command to the operating system. Various operating systems format disks differently. Thus, you typically cannot use a disk formatted in one operating system in a computer that has a different operating system. For example, you cannot use a Mac OS floppy disk in a computer that uses the Windows operating system — without special hardware and software.

With the Windows operating system, the formatting process also defines the file allocation table. The **file allocation table** (**FAT**) is a table of information that the operating system uses to locate files on a disk. The FAT is like a library card catalog for your disk, which contains a listing of all files, file types, and locations. If you format a disk that already contains data, instructions, or information, the formatting process erases the file location information and redefines the file allocation table for these items. Thus, formatting does not erase the actual files on the disk. For this reason, if you accidentally format a disk, you often can unformat it with a utility program.

Controlling a Network

Some operating systems are network operating systems. A **network operating system**, also called a **network OS** or **NOS** (pronounced nauce), is an operating system that supports a network. As discussed in Chapter 1, a **network** is a collection of computers and devices connected together via communications media and devices such as cables, telephone lines, and modems. Some networks are wireless, that is, use no physical lines or wires.

In some networks, the **server** is the computer that controls access to the hardware and software on the network and provides a centralized storage area for programs, data, and information. The other computers on the network, called **clients**, rely on the server(s) for resources such as files, devices, processing power, and storage (Figure 8-16).

A network OS organizes and coordinates how multiple users access and share resources on the network. Resources include programs, files, and devices such as printers and drives. The network administrator uses the network OS to add and remove users, computers, and other devices to and from the network.

Some operating systems have network features built into them. In other cases, the network OS is a set of programs separate from the operating system on the client computers. When they are not connected to the network, the client computers use their own operating system. When connected to the network, the network OS assumes most of the functions of the operating system.

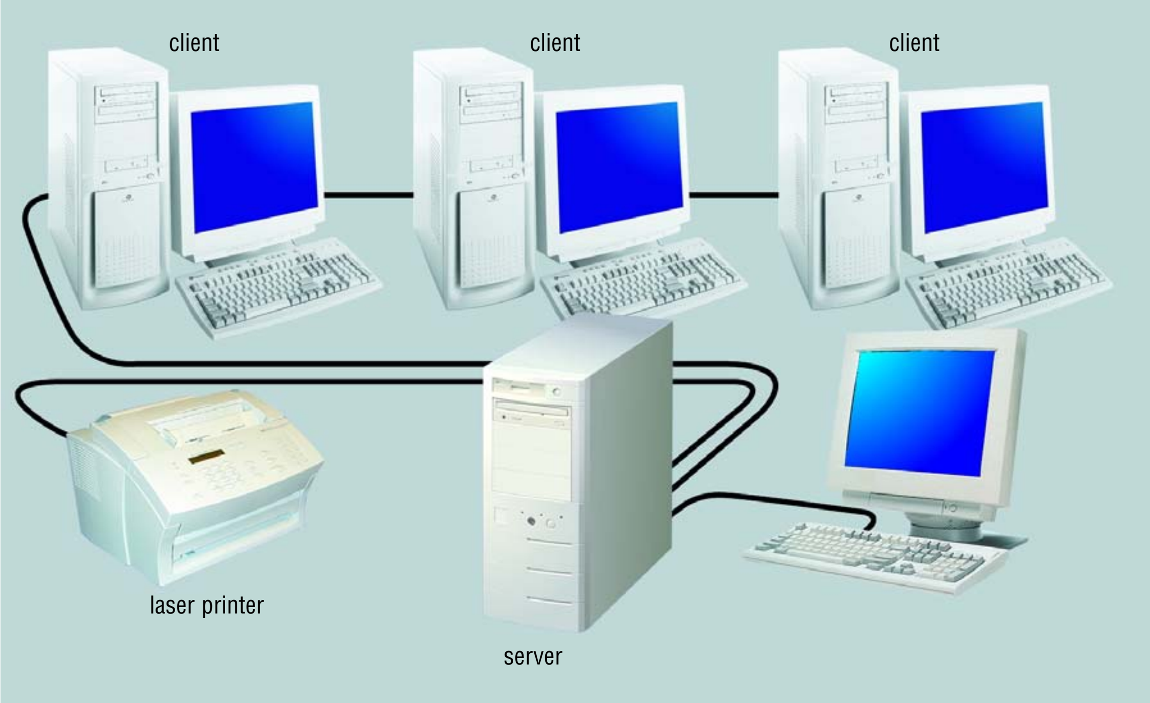
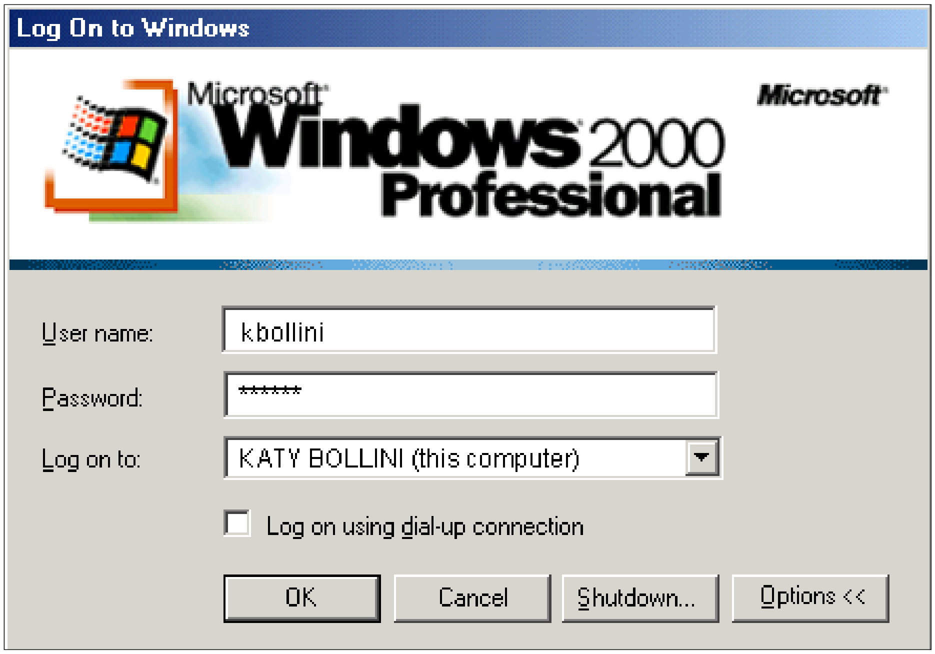


Figure 8-16 On a client/server network, one or more computers are designated as a server, and the other computers on the network are called clients.

Administering Security

When network administrators establish user accounts, each account typically requires a user name and password to access, or **log on**, to the network (Figure 8-17). A **user name**, or **user ID**, is a unique combination of characters, such as letters of the alphabet or numbers, that identifies one specific user. Many users select a combination of their first and last names as their user name. A user named Katy Bollini might choose kbollini as her user name.



User name: kbollini

Password: ******

Log on to: KATY BOLLINI (this computer)

☐ Log on using dial-up connection

Figure 8-17 Most multiuser operating systems allow each user to log on, which is the process of entering a user name and a password into the computer.

A **password** is a combination of characters associated with the user name that allows access to certain computer resources. To prevent unauthorized users from accessing those computer resources, you should keep your password confidential. As you enter your password, most computers hide, or mask, the actual password characters by displaying some other characters, such as asterisks (*).

After entering your user name and password, the operating system compares your entries with a list of authorized user names and passwords. If your entries match the user name and password kept on file, the operating system grants you access. If the entries do not match, the operating system denies you access. The operating system also records successful and unsuccessful logon attempts in a file. This allows the network administrator to review who is using or attempting to use the computer. Network administrators also use these files to monitor computer usage.

The network administrator uses the network OS to establish permissions to resources. These permissions define who can access certain resources and when they can access those resources. Some operating systems allow the network administrator to assign passwords to files and commands, restricting access to only authorized users.

Network administrators using Windows 2000 Server easily manage user access and resources through its Active Directory service. **Active Directory** (**AD**) is a feature of Windows 2000 Server that allows network administrators to manage all network information including users, devices, settings, and connections from a central environment — even if components of the network are not located in the same physical areas. A later section in this chapter discusses Windows 2000 Server in more depth.

ISSUE

Three Tries and You're Out

Password Authentication

If your educational institution uses a network to access the system, you most likely must enter a user name and password. The password helps ensure that unauthorized users do not gain access. User names and passwords, however, do not necessarily guarantee proper network security. A recent survey by the Computer Security Institute reported that some 70 percent of the organizations polled said that their network defenses had been breached. Some organizations address this issue by requiring the user's password to be several characters long. They also enforce a limit on the number of password entry attempts. What is your opinion of this security measure? Do you think the number of attempts should be limited to three? Why or why not? Does a long password add to security measures? Many Web sites also require passwords. Can a Web site be secure? Why or why not? Should a Web site limit the number of password entry attempts to three?

For more information on network security and password authentication, visit the Discovering Computers 2002 Issues Web page (**scsite.com/dc2002/issues.htm**) and click Chapter 8 Issue #2.

TYPES OF OPERATING SYSTEMS

Many of the first operating systems were device dependent and proprietary. A **device-dependent** software product is one that runs only on a specific type of computer. **Proprietary software** is privately owned and limited to a specific vendor or computer model. When manufacturers introduced a new computer or model, they often produced an improved and different proprietary operating system. Problems arose, however, when a user wanted to switch computer models or manufacturers. The user's application software often would not work on the new computer because the applications were designed to work with a specific operating system.

Some operating systems still are device dependent. The trend today, however, is toward **device-independent** operating systems that run on many manufacturers' computers. The advantage of device independent operating systems is you can retain existing application software and data files even if you change computer models or vendors. This feature generally represents a sizable savings in time and money.

New versions of an operating system usually are downward compatible. A **downward-compatible** operating system is one that recognizes and works with application software written for an earlier version of the operating system. The application software, by contrast, is said to be upward compatible. An **upward-compatible** product is written for an earlier version of the operating system, but also runs with the new version.

Three basic categories of operating systems exist today: stand-alone, network, and embedded. The table in Figure 8-18 lists examples of operating systems in each category. The following pages discuss the operating systems listed in the table.

STAND-ALONE OPERATING SYSTEMS

A **stand-alone operating system** is a complete operating system that works on a desktop or notebook computer. Some stand-alone operating systems, called **client operating systems**, also work in conjunction with a network operating system. That is, client operating systems can operate with or without a network.

Examples of stand-alone operating systems are DOS, Windows 3.x, Windows 95, Windows NT Workstation, Windows 98, Windows 2000 Professional, Windows Millennium Edition, Mac OS, OS/2 Warp, UNIX, and Linux. The following paragraphs briefly discuss most of these operating systems. The section that covers network operating systems discusses UNIX and Linux.

DOS

The term **DOS** (**Disk Operating System**) refers to several single user operating systems developed in the early 1980s for personal computers. The two more widely used versions of DOS were PC-DOS and MS-DOS. Microsoft Corporation developed both PC-DOS and MS-DOS. The functionality of these two operating systems was essentially the same. The basic difference was the type of computer on which they were installed. Microsoft developed PC-DOS (Personal Computer DOS) for IBM, which in turn installed and sold PC-DOS on its computers. At the same time, Microsoft marketed and sold MS-DOS (Microsoft DOS) to makers of IBM-compatible PCs.

CATEGORIES OF OPERATING SYSTEMS

Stand-alone	• DOS • Windows 3.x • Windows 95 • Windows NT Workstation • Windows 98 • Windows 2000 Professional • Windows Millennium Edition • Mac OS • OS/2 Warp • UNIX • Linux
Network	• NetWare • Windows NT Server • Windows 2000 Server • OS/2 Warp Server for E-business • UNIX • Linux • Solaris
Embedded	• Windows CE • Pocket PC OS • Palm OS

Figure 8-18 Examples of stand-alone, network, and embedded operating systems.

DOS used a command-line interface when Microsoft first developed it. Later versions included both command-line and menu-driven user interfaces, as well as improved memory and disk management.

At its peak, DOS was a widely used operating system, with an estimated 70 million computers running it. Today, DOS no longer is widely used because it does not offer a graphical user interface (GUI) and it cannot take full advantage of modern 32-bit personal computer processors.

Windows 3.x

To meet the need for an operating system that had a GUI, Microsoft developed **Windows**. **Windows 3.x** refers to three early versions of Microsoft Windows: Windows 3.0, Windows 3.1, and Windows 3.11. These Windows 3.x versions were not operating systems. They were operating environments. An **operating environment** is a GUI that works in combination with an operating system to simplify its use. Windows 3.x was designed to work as an operating environment with DOS.

Windows 95

With **Windows 95**, Microsoft developed a true multitasking operating system — not an operating environment like early versions of Windows. Windows 95 thus did not require DOS to run. It did include, however, some DOS and Windows 3.x features to allow for downward compatibility.

One advantage of Windows 95 was its improved GUI, which made working with files and programs easier than the earlier versions. In addition, most programs ran faster under Windows 95 because it was written to take advantage of the processing speed in 32-bit processors (versus 16-bit processors). Windows 95 also included support for networking, Plug and Play technology, longer file names, and e-mail.

Windows NT Workstation

Microsoft developed **Windows NT Workstation** as a client operating system that could connect to a Windows NT Server. **Windows NT**, also referred to as **NT**, was an operating system designed for client/server networks. Windows NT Workstation had a Windows 95 interface. Thus, users familiar with Windows 95 easily could migrate to Windows NT Workstation. Businesses most often used Windows NT Workstation.

Windows 98

Microsoft developed an upgrade to the Windows 95 operating system, called Windows 98. The **Windows 98** operating system was more integrated with the Internet than Windows 95. For example, Windows 98 included Microsoft **Internet Explorer**, a popular Web browser. The Windows 98 file manager, called **Windows Explorer**, also had a Web browser look and feel. With Windows 98, you could have an **Active Desktop**™ interface, which allowed you to set up Windows so icons on the desktop and file names in Windows Explorer worked similar to Web links.

Windows 98 also provided faster system startup and shutdown, better file management, and support for multimedia technologies such as DVD and WebTV™. Windows 98 supported the Universal Serial Bus (USB) so you easily could add and remove devices on your computer.

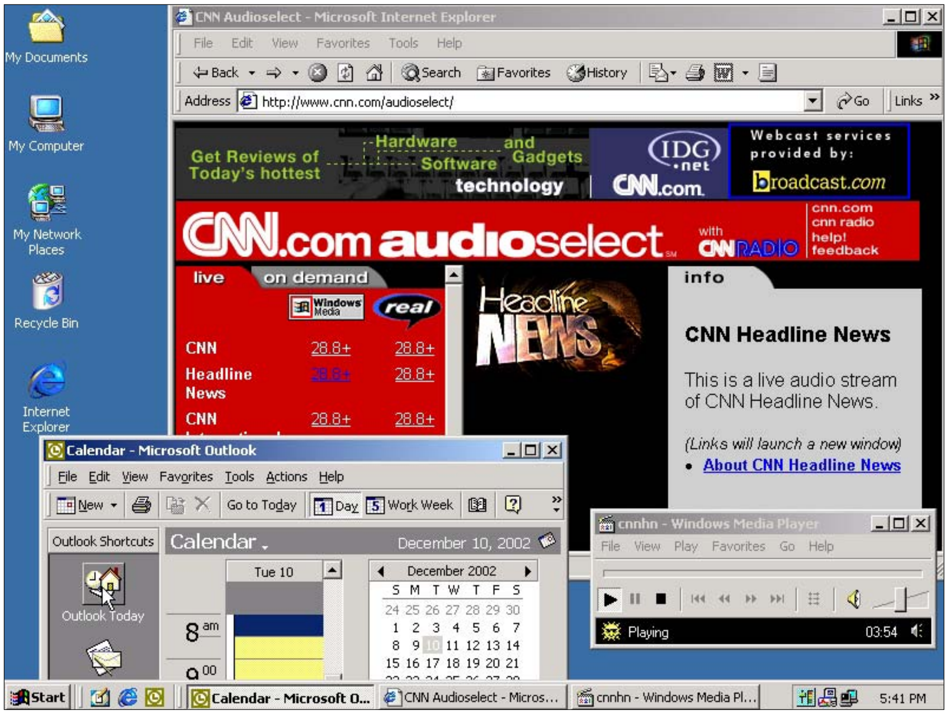
Windows 2000 Professional

Microsoft Windows 2000 Professional is an upgrade to the Windows NT Workstation operating system. **Windows 2000 Professional** is a complete multitasking client operating system that has a GUI (Figure 8-19). Windows 2000 Professional is a reliable operating system for desktop and laptop business computers.

Windows 2000 Professional includes features of previous Windows versions (Figure 8-20). Additionally, Windows 2000 Professional includes these features:

- Windows Installer Service guides you through installation or upgrade of applications
- Windows File Protection safeguards operating system files from being overwritten during installation of applications
- Certifies device drivers to safeguard them from tampering
- Faster performance than Windows 98
- Adapts Start menu to display applications you use most frequently
- Preview multimedia files in Windows Explorer before opening them
- Enhanced technology to increase efficiency and productivity of mobile users

Windows 2000 does require more disk space, memory, and a faster processor than previous versions of Windows because its features are more complex.


CNN Audioselect - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://www.cnn.com/audioselect/
Go Links
CNN.com audioselect
live on demand
CNN Headline News
info
Calendar - Microsoft Outlook
Go to Today Day Work Week
Outlook Shortcuts Calendar December 10, 2002
Outlook Today
cnnhn - Windows Media Player
Playing 03:54
Start
5:41 PM
My Documents
My Computer
My Network Places
Recycle Bin
Internet Explorer

CNN Headline News

This is a live audio stream of CNN Headline News.

(Links will launch a new window)

- About CNN Headline News

Figure 8-19 Microsoft Windows 2000 is easy to use, fast, and integrated with the Internet.

Web Link

For more information on Windows, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click Windows.

WINDOWS FEATURES

Feature	Description
1. Active Desktop™	Active Desktop™ allows you to set up Windows so icons on the desktop and file names in Windows Explorer work like links (single-click), and create real-time windows that display television-style news or an animated ticker that provides stock updates, news, or other information.
2. Taskbar/toolbars	Several new toolbars can be added to the taskbar by right-clicking the taskbar.
3. Windows Explorer has a Web browser look and feel	Several Web browser tools have been added to Windows Explorer so your hard disk is viewed as an extension of the World Wide Web. For example, Back and Forward buttons allow you easily to revisit folders you have selected previously. A Favorites menu enables you to view quickly your favorite folders.
4. Increased speed	Faster startup and shutdown of Windows. Also, loads 32-bit applications faster.
5. Tune-Up Wizard	Makes your program run faster, checks for hard disk problems, and frees up hard disk space.
6. Multiple display support	Makes it possible for you to use several monitors at the same time to increase the size of your desktop, run different programs on separate monitors, and run programs or play games with multiple views.
7. Universal Serial Bus	Add devices to your computer easily without having to restart.
8. Accessibility Settings Wizard	Accessibility options, such as StickyKeys, ShowSounds, and MouseKeys, are Wizard designed to help users with specific disabilities make full use of the computer.
9. Update Wizard	Reviews device drivers and system software on your computer, compares findings with a master database on the Web, and then recommends and installs updates specific to your computer.
10. Registry Checker	Maintenance program that finds and fixes Registry problems.
11. FAT32	FAT32 is an improved version of the File Allocation Table (file system) that allows hard drives larger than 2 GB to be formatted as a single drive.
12. Hardware support	Supports a variety of new hardware devices, such as DVD, force-feedback joysticks, digital audio speakers, and recording devices. Improved Plug and Play capabilities make installing new hardware easy.

Figure 8-20 Most of the Windows operating systems include these features.

ISSUE

To Change or Not?

Operating Systems

At a recent technical conference, a speaker from a noted software company told an audience of IT professionals that upgrading to a new operating system would be seamless. His listeners responded with uncontrollable laughter. Adopting a new operating system seldom is easy. As a result, no matter what the benefits, people often are reluctant to give up their old operating systems. Although reviewers agree each new Windows version offers several advantages over previous versions, one of the earlier versions of the operating system, Windows 95, is still in use. Why might people be unwilling to embrace new operating system versions? How could developers hasten acceptance of a new operating system? If you generally are satisfied with your current operating system, would you upgrade? Why or why not?

For more information on operating systems and Windows, visit the Discovering Computers 2002 Issues Web page (**scsite.com/dc2002/issues.htm**) and click Chapter 8 Issue #3.

Windows Millennium Edition

Windows Millennium Edition is an upgrade to the Windows 98 operating system. **Windows Millennium Edition**, also called **Windows Me** (pronounced EM-ee), is an operating system that has features specifically for the home user (Figure 8-21). In addition to providing the capabilities in Windows 98, Windows Me offers these additional features:

- Digitize, edit, and store home movies and still photographs using Windows Movie Maker
- Easily transfer photographs from a digital camera with Windows Image Acquisition
- Listen to audio CDs or Web radio stations with Windows Media Player
- Use Windows Restore to recover previous computer settings when a problem occurs
- Deliver the latest system updates automatically to your desktop when you are connected to the Internet
- Easily set up a home network
- Use Internet Connection Sharing so that multiple members of the house can all connect to the Internet at the same time
- Send instant messages
- Use NetMeeting to have a video telephone call

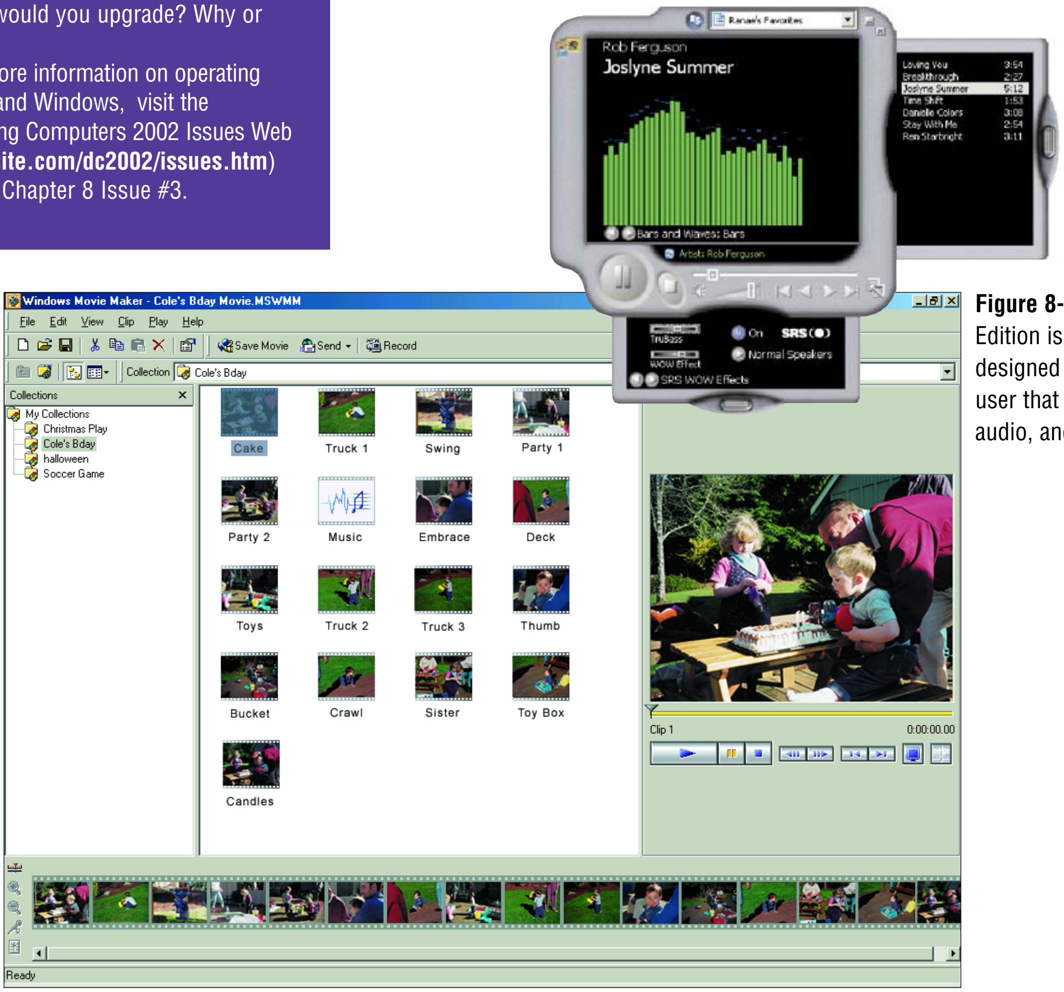
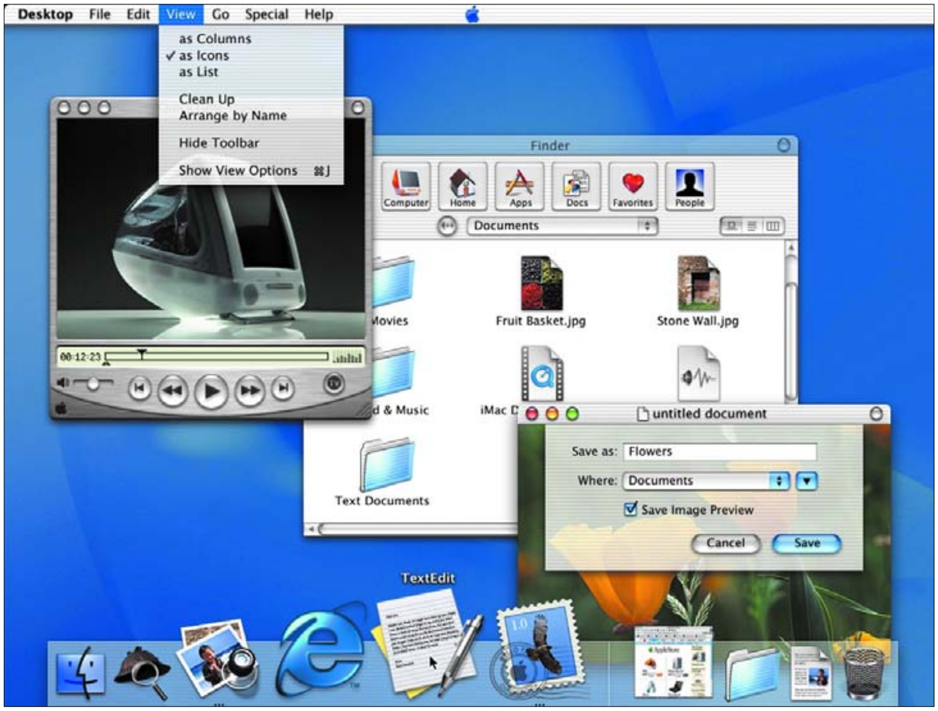


Figure 8-21 Windows Millennium Edition is an operating system designed specifically for the home user that includes many graphic, audio, and video applications.

Mac OS

Apple's **Macintosh operating system** was the first commercially successful GUI. It was released with Macintosh computers in 1984. Since then, it has set the standard for operating system ease of use and has been the model for most of the new GUIs developed for non-Macintosh systems.

Recently, Apple changed the name of the operating system from Macintosh operating system to Mac OS. **Mac OS** is a multitasking operating system available only for computers manufactured by Apple. Figure 8-22 shows a screen of the latest version of Mac OS. This version includes two popular Web browsers: Netscape Navigator and Microsoft Internet Explorer. It also has the capability of opening, editing, and saving files created using the Windows and DOS platforms. Other features of the latest version of Mac OS include large photo-quality icons, built-in networking support, electronic mail, online shopping, enhanced speech recognition, and enhanced multimedia capabilities.



Save as: Flowers

Where: Documents

☑ Save Image Preview

Figure 8-22 Mac OS is the operating system used with Apple Macintosh computers.

Web Link

For more information on Mac OS, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click Mac OS.

COMPANY ON THE CUTTING EDGE

Apple Computer, Inc.

Mac OS X Introduces Technologies

Actor Richard Dreyfuss says his Apple Macintosh makes him a thousand times more productive. Humanitarian and boxing champion Muhammed Ali uses his Mac for philanthropic efforts. Comedian Sinbad would select Apple's QuickTime software if he could have only one application. These AppleMasters praise Apple's hardware and software virtues, as do millions of users in more than 120 countries.

Steven Jobs and Stephen Wozniak formed Apple in 1976 when they decided to market the Apple I, a circuit board they had developed in Jobs' garage. They incorporated one year later and introduced the Apple II, the personal computer that helped generate more than $1 billion in annual sales.

The Apple II product line was discontinued in 1993, and the following year Apple introduced the high-performance Power Macintosh line. Apple then licensed its operating system to other computer manufacturers. This decision was reversed later, however, as other manufacturers reduced Apple's market share and revenues dropped. After a series of personnel changes, Jobs became Apple's CEO. Under his direction, Apple introduced the iBook, the PowerMac G4, and the Mac OS X, which includes iTools, an Internet search feature called Sherlock, and QuickTime TV.

For more information on Apple Computers, visit the Discovering Computers 2002 Companies Web page (**scsite.com/dc2002/companies.htm**) and click Apple.

OS/2 Warp

OS/2 Warp is IBM's GUI multitasking client operating system that supports networking, the Internet, Java, and speech recognition (Figure 8-23). In addition to running programs written specifically for OS/2 (pronounced OH-ESS-too), the operating system also can run DOS and most Windows programs.

OS/2 has been used by businesses because of IBM's long association with business computing and OS/2's strong networking support.

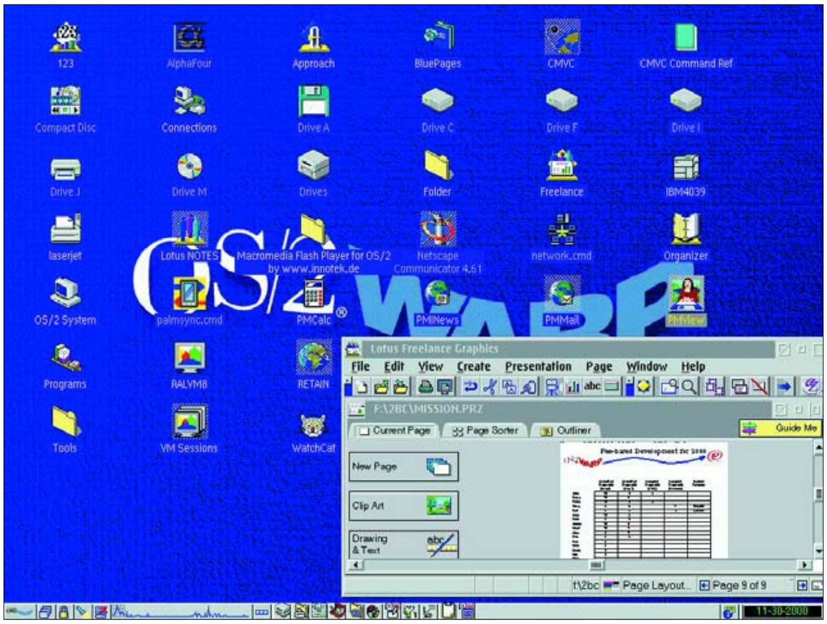


Figure 8-23 OS/2 is IBM's multitasking GUI operating system designed to work with 32-bit personal computer processors.

NETWORK OPERATING SYSTEMS

As discussed earlier in this chapter, a network operating system is an operating system that supports a network. A network operating system typically resides on a server. Recall the server is the computer that controls access to the hardware and software on the network and provides a centralized storage area for programs, data, and information. The client computers on the network rely on the server(s) for resources. Many of the client operating systems discussed in the previous section work in conjunction with a network operating system.

Examples of network operating systems include NetWare, Windows NT Server, Windows 2000 Server, OS/2 Warp Server for E-business, UNIX, Linux, and Solaris™. The following pages briefly discuss these operating systems.

NetWare

Novell's **NetWare** is a widely used network operating system designed for client/server networks. NetWare has a server portion that resides on the network server and a client portion that resides on each client computer connected to the network. The server portion of NetWare allows you to share hardware devices attached to the server (such as a printer), as well as any files or application software stored on the server. The client portion of NetWare communicates with the server. Client computers also have their own stand-alone operating system such as Windows or Mac OS.

Windows NT Server

As previously mentioned, Microsoft developed Windows NT as an operating system for client/server networks. The server in this environment used **Windows NT Server**. The client computers used Windows NT Workstation or some other stand-alone version of Windows.

Windows 2000 Server

Windows 2000 Server is an upgrade to Windows NT Server. To meet various levels of server requirements, the **Windows 2000 Server family** consists of three products: Windows 2000 Server, Windows 2000 Advanced Server, and Windows 2000 Datacenter Server. **Windows 2000 Server** is the operating system for the typical business network. **Windows 2000 Advanced Server** is an operating system designed for e-commerce applications. **Windows 2000 Datacenter Server** is best for demanding, large-scale applications such as data warehousing.

Windows 2000 Server offers these features:

- Host and manage Web sites
- Windows Distributed interNet Applications (DNA) Architecture provides a tool for easy application development across platforms
- Deliver and manage multimedia across intranets and the Internet
- Enable users to store documents in Web folders
- Manage information about network users and resources with Active Directory™
- Support clients using Windows 2000 Professional, Windows NT, Windows 98, Windows 95, Windows 3.x, Mac OS, and UNIX

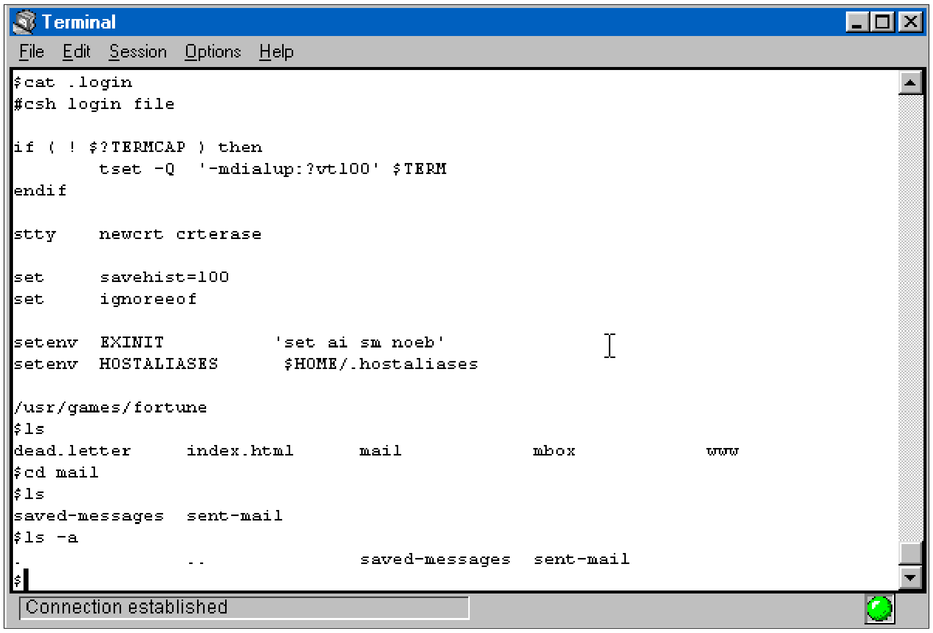
OS/2 Warp Server for E-business

OS/2 Warp Server for E-business is IBM's network operating system designed for all sizes of business. Many e-commerce applications use OS/2 Warp Server for E-business. For its Web browser and e-mail program, OS/2 Warp Server for E-business includes Netscape. Clients use OS/2 Warp or some version of Windows.

UNIX

UNIX (pronounced YOU-nix) is a multitasking operating system developed in the early 1970s by scientists at Bell Laboratories. Bell Labs (a subsidiary of AT&T) was prohibited from actively promoting UNIX in the commercial marketplace because of federal regulations. Bell Labs instead licensed UNIX for a low fee to numerous colleges and universities, where UNIX obtained a wide following. UNIX was implemented on many different types of computers. After deregulation of the telephone companies in the 1980s, UNIX was licensed to many hardware and software companies.

UNIX lacks interoperability across multiple platforms. Several versions of this operating system exist, each slightly different. When you move application software from one UNIX version to another, you must rewrite some of the programs. Another weakness of UNIX is that it has a command-line interface (Figure 8-24).



```
$cat .login
#csh login file

if ( ! $?TERMCAP ) then
        tset -Q  '-mdialup:?vt100' $TERM
endif

stty    newcrt crterase

set     savehist=100
set     ignoreeof

setenv  EXINIT          'set ai sm noeb'
setenv  HOSTALIASES      $HOME/.hostaliases

/usr/games/fortune
$ls
dead.letter     index.html      mail            mbox            www
$cd mail
$ls
saved-messages  sent-mail
$ls -a
.               ..              saved-messages  sent-mail
$
```

Connection established

Figure 8-24 Many versions of UNIX have a command-line interface.

APPLY IT!

Desktop Shortcuts

Do you use specific programs or files frequently? If so, you may want to consider a desktop shortcut. A shortcut, which displays as an icon on your desktop, is a special type of file that points to a program or file. Shortcuts allow you to open quickly a Windows object without accessing its permanent location within Windows Explorer. Double-click the icon the same as you double-click a file name.

Follow these steps to create a desktop shortcut to a program or file:

1. Point to an open area on the desktop and then right-click to display a shortcut menu.
2. Point to New and then click Shortcut to display the Create Shortcut wizard.
3. Click the Browse button and then locate the program or file to which you want to create a shortcut.
4. Click the Open (or OK) button and then click the Next button.
5. Type a name for the shortcut and then click the Finish button.

To create a desktop shortcut to other objects (such as a folder), follow these steps:

1. Use My Computer or Windows Explorer to locate the object to which you want to create a shortcut.
2. Right-click the object, and then point to Send To.
3. Click Desktop (create shortcut).

To change the shortcut's name, right-click the shortcut and then click Rename. To delete a shortcut, drag it to the Recycle Bin. This deletes the shortcut, but the original item still exists on the computer.

For more information on creating shortcuts and links to Windows operating systems, visit the Discovering Computers 2002 Apply It Web page (**scsite.com/dc2002/apply.htm**) and click Chapter 8 Apply It #1.

Web Link

For more information on Novell, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click Novell.

Many of the UNIX commands are difficult to remember and use. To help reduce this problem, some versions of UNIX offer a GUI.

Today, a version of UNIX is available for most computers of all sizes. Power users often work with UNIX because of its flexibility and power. In addition to being a stand-alone operating system, UNIX also is a network operating system. That is, UNIX is capable of handling a high volume of transactions in a multiuser environment and working with multiple processors using multiprocessing. Some call UNIX a **multipurpose operating system** because it is both a stand-alone and network operating system.

Linux

Linux is one of the fastest growing operating systems. **Linux** (pronounced LINN-uks) is a popular, free, multitasking UNIX-type operating system. In addition to the basic operating system, Linux also includes many programming languages — all for free.

Linux is not proprietary software like the operating systems discussed thus far. Instead, Linux is **open-source software**, which means its code is available to the public. Based on UNIX, many programmers have donated time to make Linux the best possible version of UNIX. Promoters of open-source software state two main advantages: users that modify the software share their improvements with others, and customers can personalize the software to meet their needs.

Some versions of Linux are command-line. Others are GUI. The two most popular GUIs available for Linux are GNOME and KDE.

You can obtain Linux in a variety of ways. You can download it from the Web free of charge. Many Linux books include a CD-ROM containing Linux. Some vendors sell a CD-ROM version of Linux. If you are purchasing a new computer, some retailers will pre-install Linux on the hard disk. Some companies market software applications that run on their own version of Linux. Figure 8-25 shows Red Hat Linux's GNOME graphical user interface.

PRODUCT ON THE CUTTING EDGE

LiNUX.

Users Embrace Free Operating System

Linux belongs to everybody, according to its creator, Linus Torvalds. Although he owns the trademark for the name and is in charge of development, a large, friendly community distributes the operating system. These individuals are driven to offer an alternative to Microsoft Windows and Apple Mac OS, and they have an extensive number of user groups, mailing lists, newsletters, and forums.

Linux' GNU General Public License allows anyone to obtain and modify the source code and then redistribute the revised product. Torvalds encourages this creativity and productivity, believing that the refinements ultimately stimulate more interest in the product and increase its popularity.

He admits he is not opposed to commercial software because the revenue it generates helps support the development of new incentives that help create a polished product, which most free software does not have. For example, commercial software packages — especially word processing — usually have a better user interface than free software does. But many Linux applications and games are available.

For more information on Linux, visit the Discovering Computers 2002 Companies Web page (**scsite.com/dc2002/companies.htm**) and click Linux.

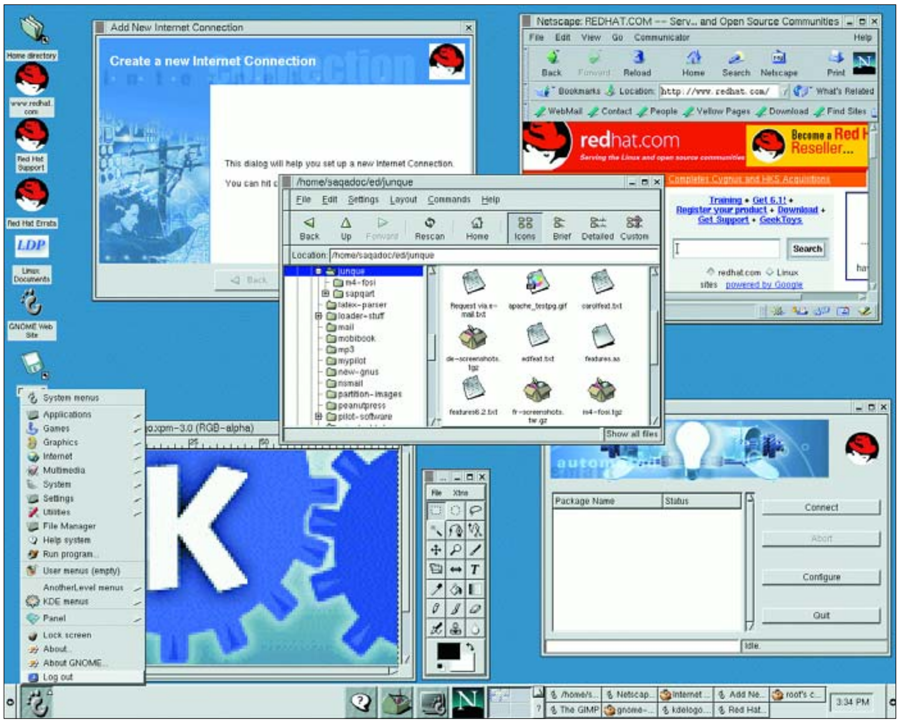

Add New Internet Connection
Create a new Internet Connection
This dialog will help you set up a new Internet Connection.
Netscape: REDHAT.COM -- Serv... and Open Source Communities
redhat.com
Become a Red Hat Reseller...
/home/saqadoc/ed/junque
File Edit Settings Layout Commands Help
Back Up Forward Rescan Home Icons Brief Detailed Custom
Location: /home/saqadoc/ed/junque
System menus
Applications
Games
Graphics
Internet
Multimedia
System
Settings
Utilities
File Manager
Help system
Run program...
User menus (empty)
AnotherLevel menus
KDE menus
Panel
Lock screen
About...
About GNOME...
Log out
Package Name
Status
Connect
Abort
Configure
Quit
3:34 PM

Figure 8-25 Red Hat provides a version of Linux called Red Hat Linux. Shown here is the GNOME graphical user interface.

Solaris

Solaris™, a version of UNIX developed by Sun Microsystems, is a network operating system designed specifically for e-commerce applications. Solaris™ can manage high-traffic accounts and incorporate security necessary for Web transactions. Client computers use a version of Solaris™, called CDE (Common Desktop Environment), that specifically works with the Solaris™ operating system.

EMBEDDED OPERATING SYSTEMS

The operating system on most handheld computers and small devices, called an **embedded operating system**, resides on a ROM chip.

Popular embedded operating systems include Windows CE, Pocket PC OS, and Palm OS. The following pages discuss these operating systems.

Windows CE

Windows CE is a scaled-down Windows operating system designed for use on wireless communications devices and smaller computers such as handheld computers, in-vehicle devices, and Web-enabled devices. On most of these devices, the Windows CE interface incorporates many elements of the Windows GUI. The operating system also supports color, sound, multitasking, e-mail, and Internet capabilities. Many applications, such as Microsoft Word and Microsoft Excel, have scaled-down versions that run with Windows CE.

TECHNOLOGY TRAILBLAZER

LINUS **TORVALDS**

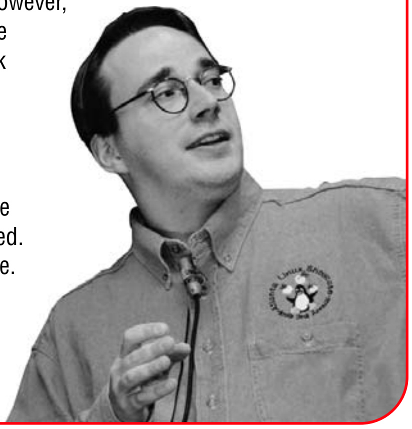
Free is good, in the mind of Linus Torvalds and the millions of people who benefit from his free operating system, Linux.

The software's roots began when Torvalds was a student in Finland and began writing an operating system for a study he was performing. He believes that Finland's high level of technology and superior educational system gave him the advantages of being able to concentrate on his brainstorm instead of worrying about economic issues.

Today he considers himself the operating system's lead technical developer and still spends time writing code. Due to Linux' success, however, he now has to delegate tasks and spend more time answering e-mail messages and coordinating work efforts. He knows that everyone agrees that he is in charge and is solely responsible for project management, setting milestones, and making radical decisions.

Torvalds states that he does not worry about the future of Linux and that it will continue to be refined. His sole long-range plan is to improve the software.

For more information on Linus Torvalds, visit the Discovering Computers 2002 People Web page (**scsite.com/dc2002/people.htm**) and click Linus Torvalds.



Web Link

For more information on UNIX, visit the Discovering Computers 2002 Chapter 8 WEB LINK page (**scsite.com/dc2002/ch8/weblink.htm**) and click UNIX.

ISSUE

UNIX versus Windows

Choosing an Operating System

A question that confronts the IT management, individuals, and companies worldwide when upgrading computers is "What operating system should we select?" Price is certainly a consideration. Determining price, however, includes the original operating system cost, maintenance, and upgrade. Microsoft Windows definitely has the edge as far as the most widely used and popular operating system. UNIX, which includes a family of operating systems such as Linux, AIX, OpenBSD, and others, is a free open-source program. UNIX is a mature system, developed in the early 1970s, long before Microsoft even existed. Why then, would a company select Microsoft instead of UNIX or one of the operating systems from the UNIX family? Which one would you select? Why? Is Microsoft a better operating system than UNIX? What operating system factors would you consider when purchasing a new personal computer? Would you buy a computer with a UNIX-based operating system?

For more information on operating systems and upgrading operating systems, visit the Discovering Computers 2002 Issues Web page (**scsite.com/dc2002/issues.htm**) and click Chapter 8 Issue #4.

The **Auto PC** is a device mounted onto a vehicle's dashboard that is powered by Windows CE (Figure 8-26). Using an automobile equipped with Auto PC, the driver can obtain information such as driving directions, traffic conditions, weather, and stock quotes; access and listen to e-mail; listen to the radio or an audio CD; and share information with a handheld or notebook computer. The Auto PC is ideal for the mobile user because it is directed through voice commands.

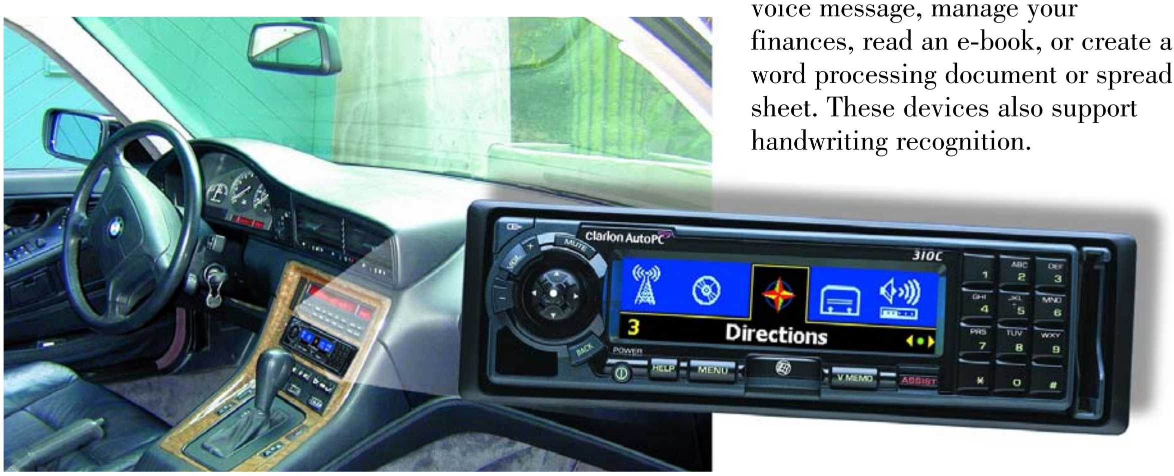


Figure 8-26 Auto PC is powered by Windows CE.

Pocket PC OS

Pocket PC OS is a scaled-down operating system developed by Microsoft that works on a specific type of handheld computer, called a **Pocket PC** (Figure 8-27). With this operating system and a Pocket PC device, you have access to all the basic PIM functions such as contact lists, schedules, tasks, calendars, and notes. These devices also provide many other features. For example, you can check e-mail, browse the Web, listen to music, send and receive instant messages, record a voice message, manage your finances, read an e-book, or create a word processing document or spreadsheet. These devices also support handwriting recognition.

APPLY IT!

Pocket PC OS versus Palm OS

You are ready to purchase a handheld computer. Next is the difficult part — which operating system to choose. The Palm OS® currently runs on many handheld computers, including all Palms, PalmPilots, and Handspring™ Visors. Microsoft's Pocket PC, however, is creating stiff competition. To make a decision, you first must evaluate your own personal needs and then determine which OS is for you. Some features you may want to consider are as follows:

- Your use as a student may be to take notes, keep track of your class schedule, play music, and play games.
- For business needs, you may need to keep a contact list, an appointment schedule, and keep in touch with clients via e-mail.
- For personal use, you may want to keep track of birthdays, maintain a list of addresses, keep a calendar, and access news.

After establishing your goals, your next step is to compare the two operating systems and determine which one has the features that best meet your needs. Some features to consider in your comparison are as follows:

- Ease of use
- Synchronizing with your personal computer
- Application availability (calendar, games, notes, appointments, music, e-mail, contacts, and so on.)
- Price
- Color display
- Battery life

For more information and links to Palm OS and Pocket PC, visit the Discovering Computers 2002 Apply It Web page (**scsite.com/dc2002/apply.htm**) and click Chapter 8 Apply It #2.

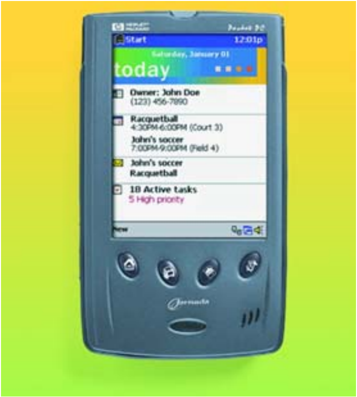


Figure 8-27 The Pocket PC OS runs on any Pocket PC device.

Palm OS

The Palm handheld computers from Palm, Inc., and Visor handheld computers from Handspring™ use an operating system called **Palm OS**®. With this operating system and a compatible handheld computer, you can manage schedules and contacts and easily synchronize this information with a desktop computer. With some handheld computers, you also have wireless access to the Internet and your e-mail. These handheld computers contain handwriting recognition software, called Graffiti®. They also have software that allows you to manage many different types of information such as telephone messages, project notes, reminders, task and address lists, and important dates and appointments.

UTILITY PROGRAMS

A **utility program**, also called a **utility**, is a type of system software that performs a specific task, usually related to managing a computer, its devices, or its programs. Most operating systems include several utility programs. You also can buy stand-alone utilities that offer improvements over those included with the operating system.

Some vendors offer **utility suites** that combine several utility programs into a single package. Others offer Web-based utility services. To use a **Web-based utility service**, you usually pay an annual fee that allows you to access and use the vendor's utility programs on the Web. McAfee and Norton offer utility suites and Web-based utility services.

Popular utility programs offer these functions: viewing files, compressing files, diagnosing problems, uninstalling software, scanning disks, defragmenting disks, backing up files and disks, and displaying screen savers. The following paragraphs briefly discuss each of these utilities.

File Viewer

A **file viewer** is a utility that allows you to display and copy the contents of a file. An operating system's file manager often includes a file viewer. For example, Windows Explorer has a viewer called **Imaging Preview** that displays the contents of graphics files (Figure 8-28). The title bar of the file viewer window displays the name of the file being viewed.

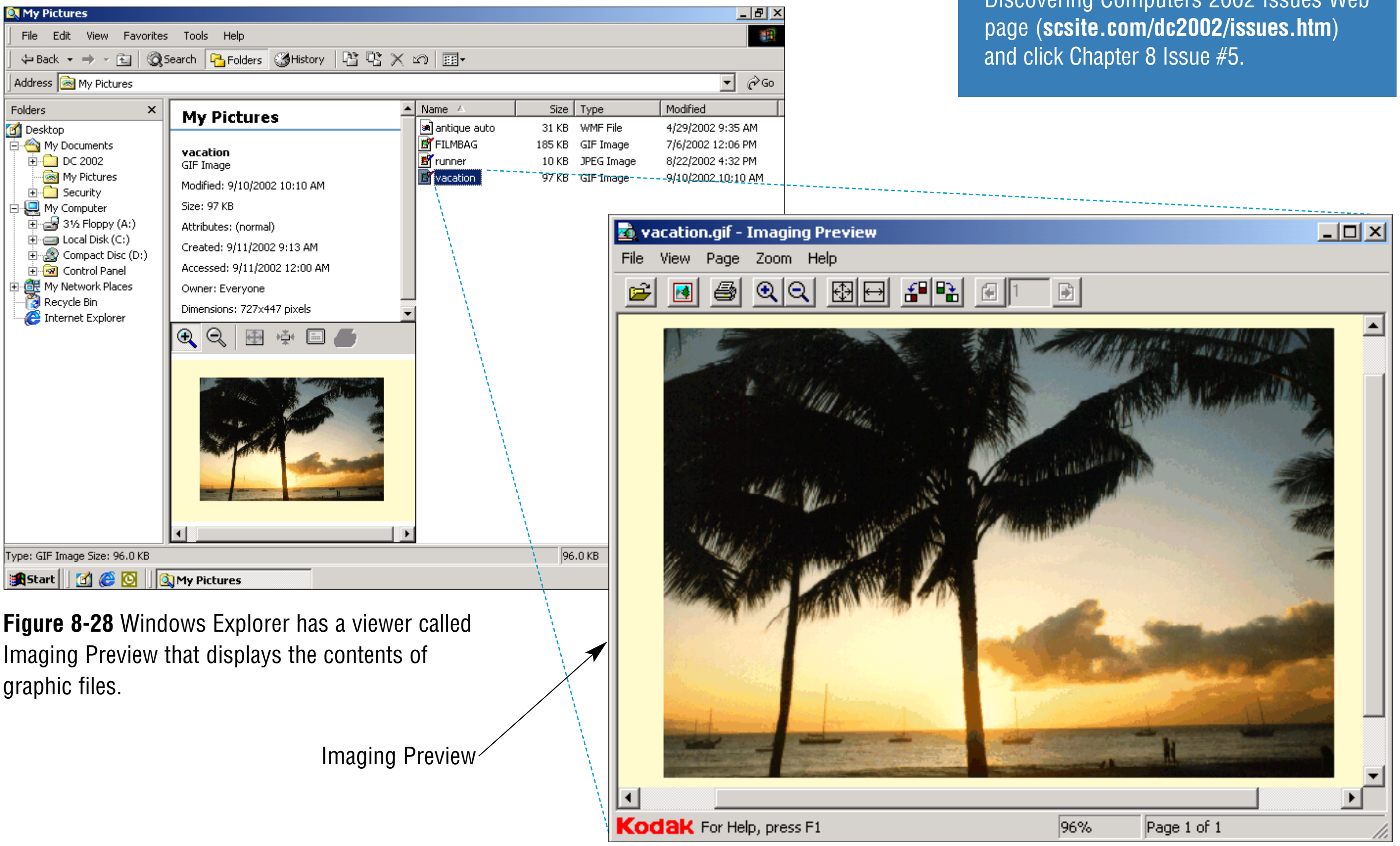
ISSUE

Waste of Money?

Utility Programs

Most operating systems include a number of utility programs. On the other hand, private companies have developed utility programs to meet user needs. One new utility helps guard against computer theft by making a weekly silent call to a control center. If the call emanates from an appropriate number, the call is logged. If the computer has been reported stolen, however, the center traces the call to locate the missing computer. Should operating systems include these types of features? Many popular operating systems include basic utilities. Why then is there a proliferation of utility programs such as PC Tools and Norton Utilities? Is purchasing one of these utilities a waste of money? Should they be sold separately or be part of the operating system? What other needs could be addressed by a utility program? If you marketed the utility program, what would you call it?

For more information on utility programs and operating systems, visit the Discovering Computers 2002 Issues Web page (**scsite.com/dc2002/issues.htm**) and click Chapter 8 Issue #5.



vacation
GIF Image
Modified: 9/10/2002 10:10 AM
Size: 97 KB
Attributes: (normal)
Created: 9/11/2002 9:13 AM
Accessed: 9/11/2002 12:00 AM
Owner: Everyone
Dimensions: 727x447 pixels

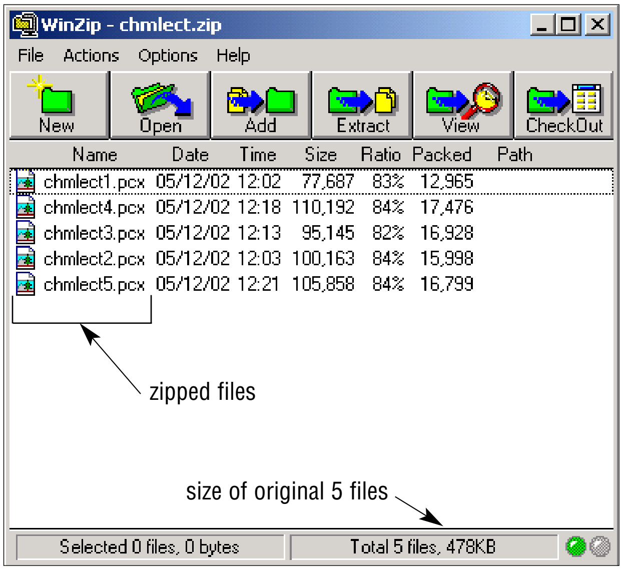
Name	Size	Type	Modified
antique auto	31 KB	WMF File	4/29/2002 9:35 AM
FILMBAG	185 KB	GIF Image	7/6/2002 12:06 PM
runner	10 KB	JPEG Image	8/22/2002 4:32 PM
vacation	97 KB	GIF Image	9/10/2002 10:10 AM

Figure 8-28 Windows Explorer has a viewer called Imaging Preview that displays the contents of graphic files.

File Compression

A **file compression utility** shrinks the size of a file. A compressed file takes up less storage space than the original file. Compressing files frees up room on the storage media and improves system performance. Attaching a compressed file to an e-mail message reduces the time needed for file transmission. Uploading and downloading compressed files to and from the Internet reduces the file transmission time.

Compressed files, sometimes called **zipped files**, usually have a .zip extension. When you receive or download a compressed file, you must uncompress it. To **uncompress**, or **unzip**, a file, you restore it to its original form. Two popular stand-alone file compression utilities are PKZIP™ and WinZip® (Figure 8-29).



Name	Date	Time	Size	Ratio	Packed	Path
chmlect1.pcx	05/12/02	12:02	77,687	83%	12,965	
chmlect4.pcx	05/12/02	12:18	110,192	84%	17,476	
chmlect3.pcx	05/12/02	12:13	95,145	82%	16,928	
chmlect2.pcx	05/12/02	12:03	100,163	84%	15,998	
chmlect5.pcx	05/12/02	12:21	105,858	84%	16,799	

Selected 0 files, 0 bytes

Total 5 files, 478KB

Figure 8-29 WinZip® is a popular stand-alone file compression utility. This zipped file (chmlect) contains 5 files. Without being zipped, these files consume 478 KB. Zipping the files reduced the amount of storage to 79 KB.

APPLY IT!

File Compression – Zipped Files

You may have received an e-mail file attachment or downloaded a file with a .zip extension. The .zip extension indicates the file has been compressed. People use file compression to reduce the size of a file, to combine several files and/or folders into a single file, and to reduce Internet download/upload time.

One of the most popular Windows file compression programs is WinZip. Because WinZip is shareware, you can download an evaluation copy.

Downloading and installing WinZip:
1. Access the WinZip Web site (see URL below).
2. Follow the instructions at the WinZip Web site to download and install the program.

Compressing a group of files:
1. Start WinZip.
2. Click I Agree when the Licensing Agreement displays.
3. Click the New button to display the New Archive dialog box.
4. Click the box arrow to the right of the Create text box and then select the folder in which you wish to save the zipped file.
5. In the File name text box, type the name of the zipped file. Do not type the extension .zip.
6. Click the OK button to display the Add dialog box.
7. If necessary, change folders and then select the files you wish to add.
8. Click the Add button.
9. You can add additional files from the same or other folders by clicking the Add button again.

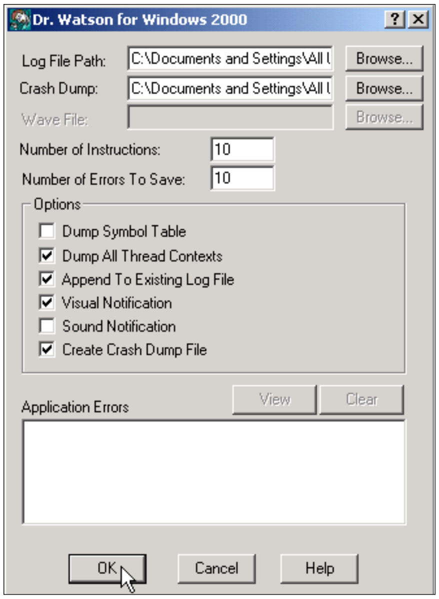
To unzip or decompress a zipped file:
1. Start Windows Explorer and double-click the file name. This starts WinZip.
2. Click the Extract button to display the Extract dialog box.
3. Select the folder in which you wish to save the extracted file(s).
4. Click the Extract button.
5. After the files are extracted, close the WinZip program.

Note: After Step 1, if you want to open a single file, double-click the file name instead of clicking the Extract button.

For more information on WinZip, links to other WinZip tutorials, and the Web site mentioned above, visit the Discovering Computers 2002 Apply It Web page (**scsite.com/dc2002/apply.htm**) and click Chapter 8 Apply It #3.

Diagnostic Utility

A **diagnostic utility** compiles technical information about your computer's hardware and certain system software programs and then prepares a report outlining any identified problems. For example, Windows includes the diagnostic utility, **Dr. Watson**, which diagnoses problems as well as suggests courses of action (Figure 8-30).



Log File Path: C:\Documents and Settings\All U

Crash Dump: C:\Documents and Settings\All U

Wave File:

Number of Instructions: 10

Number of Errors To Save: 10

☐ Dump Symbol Table
☑ Dump All Thread Contexts
☑ Append To Existing Log File
☑ Visual Notification
☐ Sound Notification
☑ Create Crash Dump File

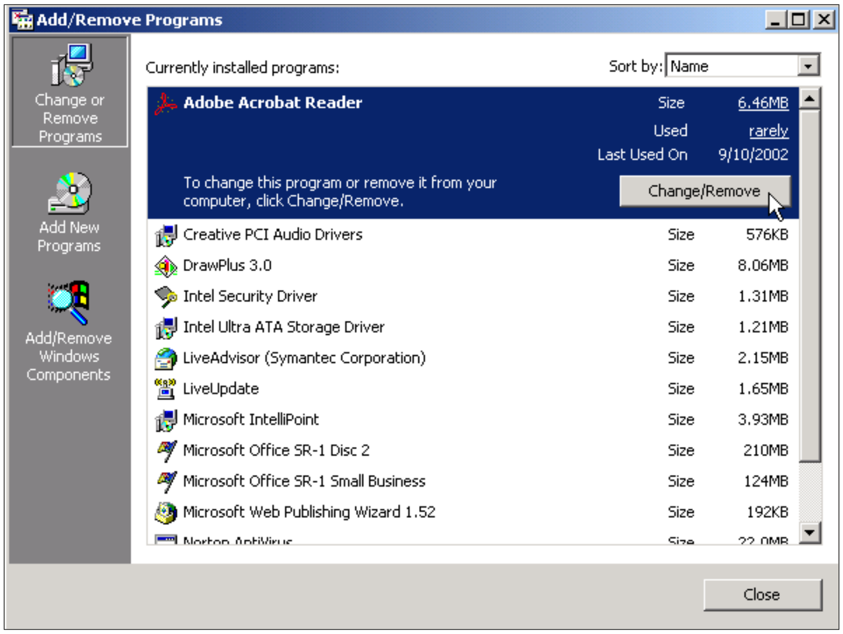
Figure 8-30 Dr. Watson is a diagnostic utility included with Windows.

Uninstaller

An **uninstaller** is a utility that removes an application, as well as any associated entries in the system files (Figure 8-31). When you install an application, the operating system records the information it uses to run the software in the system files. The system file entries will remain, if you attempt to remove the application from your computer by deleting the files and folders associated with the program without running the uninstaller. Most operating systems include an uninstaller. You also can purchase a stand-alone program, such as McAfee's UnInstaller.

Disk Scanner

A **disk scanner** is a utility that (1) detects and corrects both physical and logical problems on a hard disk or floppy disk and (2) searches for and removes unnecessary files. A physical problem is one with the media such as a scratch on the surface of the disk. A logical problem is one with the data, such as a corrupted file allocation table (FAT). Windows includes two disk scanner utilities. One detects problems and the other searches for and removes unnecessary files such as temporary files (Figure 8-32).



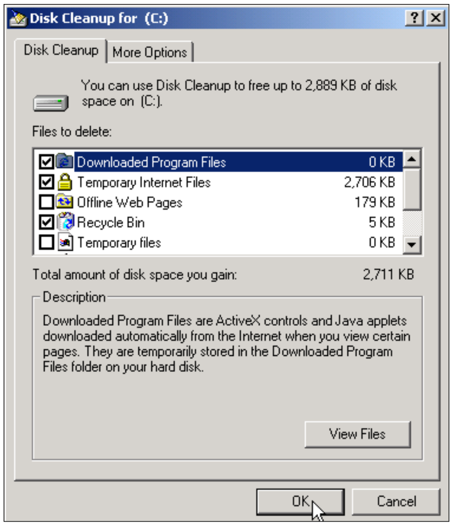
Currently installed programs: Sort by: Name

Adobe Acrobat Reader Size 6.46MB
Used rarely
Last Used On 9/10/2002

To change this program or remove it from your computer, click Change/Remove.

Creative PCI Audio Drivers	Size	576KB
DrawPlus 3.0	Size	8.06MB
Intel Security Driver	Size	1.31MB
Intel Ultra ATA Storage Driver	Size	1.21MB
LiveAdvisor (Symantec Corporation)	Size	2.15MB
LiveUpdate	Size	1.65MB
Microsoft IntelliPoint	Size	3.93MB
Microsoft Office SR-1 Disc 2	Size	210MB
Microsoft Office SR-1 Small Business	Size	124MB
Microsoft Web Publishing Wizard 1.52	Size	192KB
Norton AntiVirus	Size	22.0MB

Figure 8-31 An uninstaller removes software applications and associated system file entries from your hard disk.



You can use Disk Cleanup to free up to 2,889 KB of disk space on (C:).

Files to delete:

☑	Downloaded Program Files	0 KB
☑	Temporary Internet Files	2,706 KB
☐	Offline Web Pages	179 KB
☑	Recycle Bin	5 KB
☐	Temporary files	0 KB

Total amount of disk space you gain: 2,711 KB

Description

Downloaded Program Files are ActiveX controls and Java applets downloaded automatically from the Internet when you view certain pages. They are temporarily stored in the Downloaded Program Files folder on your hard disk.

Figure 8-32 Disk Cleanup searches for and removes unnecessary files.

TECHNOLOGY TRAILBLAZER

PHILLIP **KATZ**

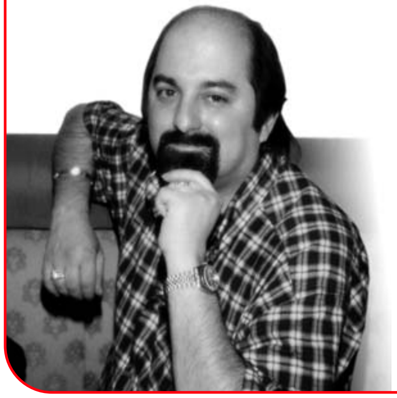
It happens every time you are packing for your vacation: you have too much stuff crammed in your suitcase, and you cannot close the zipper. Phillip Katz had a similar problem: too much stuff to cram onto a floppy disk. He decided to do something about this situation and developed PKZIP, using his initials as the first letters in the software's name.

As a high school student in suburban Milwaukee, Katz was brilliant and creative. He was enrolled in advanced math and physics classes and participated on the math team.

Six years after graduation, he quit his job as a software design engineer and started his business, PKWARE, with his mother at their kitchen table.

The innovative PKZIP shareware cornered the data compression market, and PKWARE has steady annual sales of $5 million. This success, however, was not enough to fulfill Katz' life. He lived his life alone and as a transient, never attending computer conferences or lectures and losing contact with his mother. He died unexpectedly in 2000 at the young age of 37.

For more information on Phillip Katz, visit the Discovering Computers 2002 People Web page (**scsite.com/dc2002/people.htm**) and click Phillip Katz.



Disk Defragmenter

A **disk defragmenter** is a utility that reorganizes the files and unused space on a computer's hard disk so the operating system can access data more quickly and programs can run faster. When an operating system stores data on a disk, it places the data in the first available sector on the disk. Although it attempts to place data in sectors that are contiguous (next to each other), this is not always possible. When the contents of a file are scattered across two or more noncontiguous sectors, the file is **fragmented**. Fragmentation slows down disk access and thus the performance of the entire computer. **Defragmenting** the disk, or reorganizing it so the files are stored in contiguous sectors, solves this problem (Figure 8-33). Windows includes a disk defragmenter, called **Disk Defragmenter**.

Backup Utility

A **backup utility** allows you to copy, or backup, selected files or your entire hard disk onto another disk or tape. During the backup process, the backup utility monitors progress and alerts you if it needs additional disks or tapes. Many backup programs will compress files during this process, so the backup files require less storage space than the original files.

For this reason, you usually cannot use backup files in their backed up form. In the event you need to use one of these files, a **restore program** reverses the process and returns backed up files to their original form. Backup utilities include restore programs.

You should back up files and disks regularly in the event your originals are lost, damaged, or destroyed. Windows includes a backup utility (Figure 8-34). Some users opt to back up their files to an Internet hard drive. As described in Chapter 7, an Internet hard drive, sometimes called online storage, is a service on the Web that provides storage to computer users.

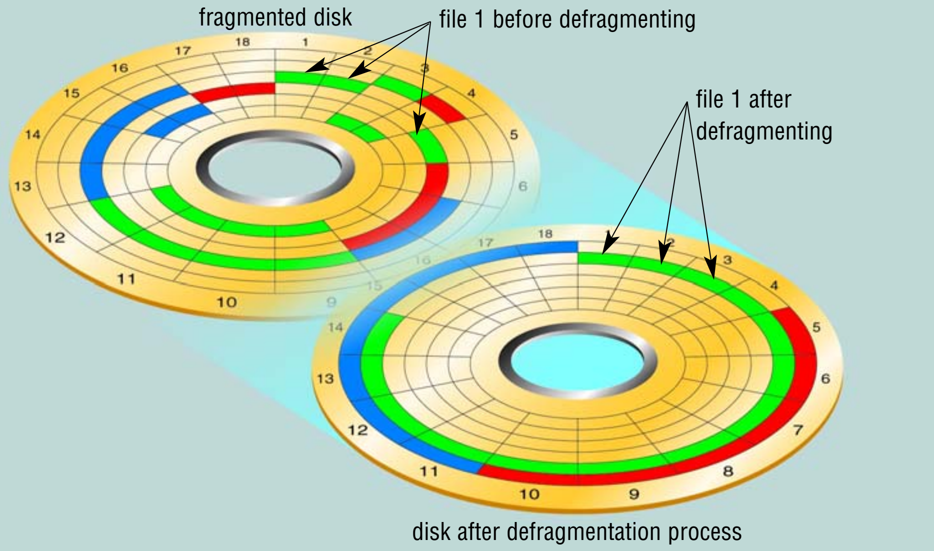
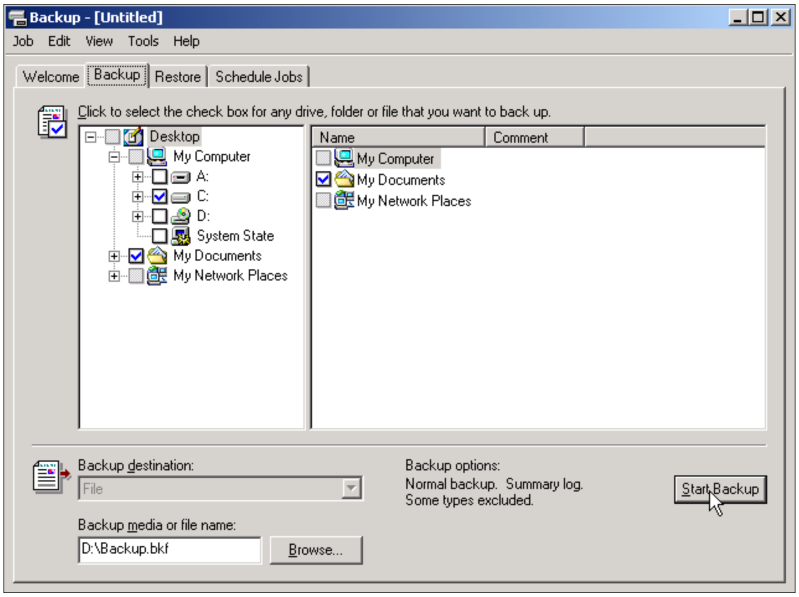

fragmented disk
file 1 before defragmenting
file 1 after defragmenting
disk after defragmentation process
18
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Figure 8-33 A fragmented disk has many files stored in noncontiguous sectors. Defragmenting reorganizes the files, so they are located in contiguous sectors, which speeds access time.



Click to select the check box for any drive, folder or file that you want to back up.

☐ My Computer
☑ My Documents
☐ My Network Places

Backup destination: File

Backup options:
Normal backup. Summary log.
Some types excluded.

Backup media or file name: D:\Backup.bkf

Figure 8-34 A backup utility allows you to copy files or your entire hard disk to another disk or tape.

Screen Saver

A **screen saver** is a utility that causes a monitor's screen to display a moving image or blank screen if no keyboard or mouse activity occurs for a specified time period (Figure 8-35). When you press a key on the keyboard or move the mouse, the screen returns to the previously displayed image.

Screen savers originally were developed to prevent a problem called **ghosting**, in which images could be permanently etched on a monitor's screen. Ghosting is not a problem with today's monitors. Still, screen savers are popular for security, business, or entertainment purposes. To secure a computer, you can configure your screen saver so a user must enter a password to stop the screen saver and redisplay the previous image. Some screen savers use push technology, enabling you to receive updated and new information each time the screen saver displays. As described in Chapter 2, push technology occurs when Web-based content downloads automatically to your computer at a regular interval or whenever the Web site updates.

An operating system often includes several screen savers. You also can purchase screen savers or download them from the Web.

CHAPTER SUMMARY

This chapter defined an operating system and then discussed the functions common to most operating systems. The chapter also presented a variety of stand-alone operating systems, network operating systems, and embedded operating systems. Finally, the chapter discussed several utility programs used with today's personal computers.

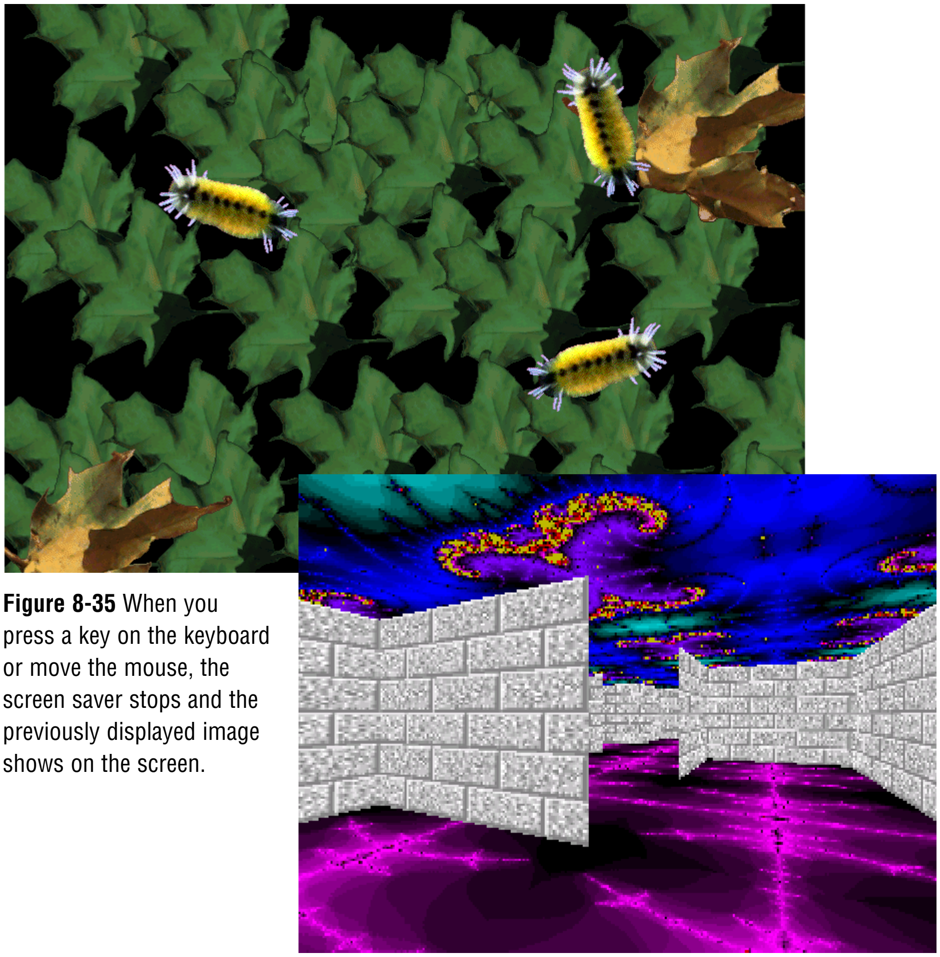


Figure 8-35 When you press a key on the keyboard or move the mouse, the screen saver stops and the previously displayed image shows on the screen.

Network Administrator

Networking professionals are in high demand. A network administrator (NA) must have a thorough knowledge of operating system software and generally has a multifunction position. Some of the tasks an NA may be asked to complete are as follows:

- Ensure servers and workstations function properly
- Implement system backups, upgrades, and security policies
- Identify and resolve connectivity issues
- Install and maintain software on clients and servers
- Perform support of network hardware components such as terminals, servers, hubs, and routers
- Participate in technical group projects to provide networking related support and keep abreast of new developments in networking, systems, and office automation technologies
- Suggest new solutions to increase network productivity

Many network administrators have some type of networking certification, which is the first step in establishing a career as a networking professional. Some of the more popular of these certifications include Microsoft Certified System Engineer (MCSE) (see URL below), Certified Novell Engineer (CNE) (see URL below), and Cisco Certified Network Associate (CCNA) (see URL below).

Salaries within these positions vary greatly and are based on job responsibilities. Those individuals with certifications, however, can expect an approximate starting salary between $35,000 to $75,000.

To learn more about the field of a network administrator as a career and the Web sites mentioned above, visit the Discovering Computers 2002 Careers Web page (**scsite.com/dc2002/careers.htm**) and click Network Administrator.

E-WEATHER E-SPORTS E-NEWS

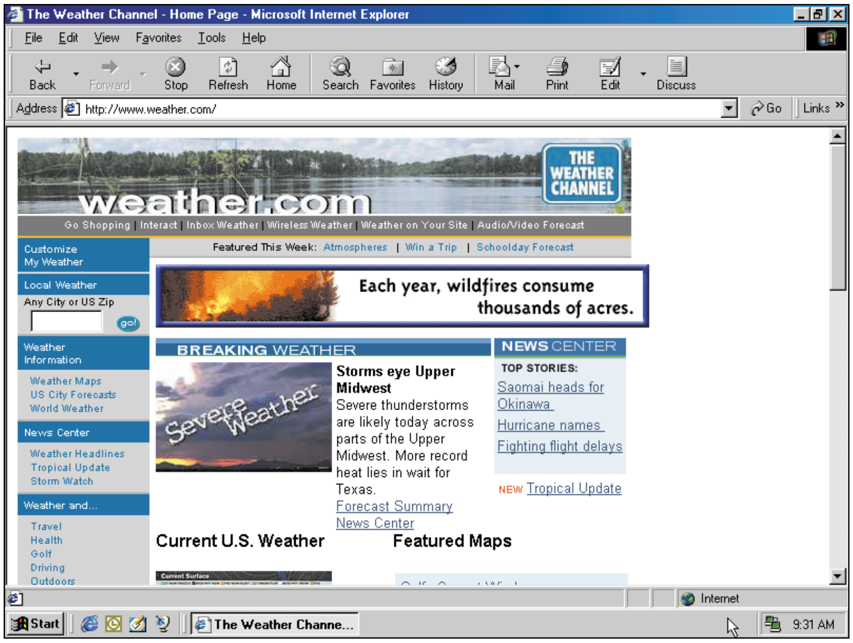
WHAT'S NEWS?

Weather, Sports, and News Web Sites Score Big Hits

Rain or sun? Hot or cold? Do you toss a coin to determine tomorrow's forecast? Or, do you study weather maps displayed on television and Internet sites? The world seems neatly divided into these two camps, with Web sites such as The Weather Channel (Figure 8-36) receiving more than 10 million hits each day. Weather is the leading online news item, with at least 10,000 Web sites devoted to this field. A few of the more popular Web sites are listed in Figure 8-37. A multitude of news, sports, and weather Web sites resides on the Internet.

Baseball may be the national pastime, but sports aficionados yearn for major league football, basketball, and hockey along with everything from auto racing to cricket. Although television has four major networks and two live, 24-hour all-sports channels, these media outlets do not provide enough action to quench the thirst of fans across the globe. The Internet fills this void with such Web sites as CBS SportsLine.com (Figure 8-38), with more than one million pages of multimedia sports news, entertainment, and merchandise, and Sports.com, which covers rugby, cricket, Formula One racing, tennis, and golf. CBS SportsLine.com creates the official Major League Football and the PGA Tour Web sites and provides content for America Online, Netscape, and Excite.

Olympics fans are hungry for sports action, results, and athlete profiles. The biggest event ever delivered on the Internet was the 2000 Olympic Games in Sydney, Australia. The official Olympics Web site received more than 6.5 billion hits during the 17-day event. That number is 10 times the number of Internet visitors at the 1998 Nagano Winter Olympic Games Web site.



Each year, wildfires consume thousands of acres.

Storms eye Upper Midwest
Severe thunderstorms are likely today across parts of the Upper Midwest. More record heat lies in wait for Texas.

Figure 8-36 Local, national, and international weather conditions, along with details on breaking weather stories, are available on The Weather Channel Web pages.

REPORTING WEB SITES	URL
Weather	
Information Please Weather Page	infoplease.com/weather.html
STORMFax®	stormfax.com
The Weather Channel	weather.com
Weatherplanner	weatherplanner.com
Wx.com	wx.com
Sports	
Athletes Direct	athletesdirect.com
CBS SportsLine	cbs.sportsline.com
ESPN.com	espn.com
Halife E-Sports	halife.com/sports/esports.html
Live Internet Sports Radio Stations	www.csi.ukns.com/radios.html
Todays Sports	todayssports.com
Sports.com	sports.com
News	
APBnews	apbnews.com
MSNBC	msnbc.com
New York Post	newyorkpost.com
Online Newspapers	onlinenewspapers.com
Silicon Valley News	mercurycenter.com/svtech/news
Starting Page Best News Sites	startingpage.com/html/news.html
The Washington Post	washingtonpost.com
The Web Cowboy	thewebcowboy.com

For an updated list of reporting Web sites, visit scsite.com/dc2002/e-rev.htm.

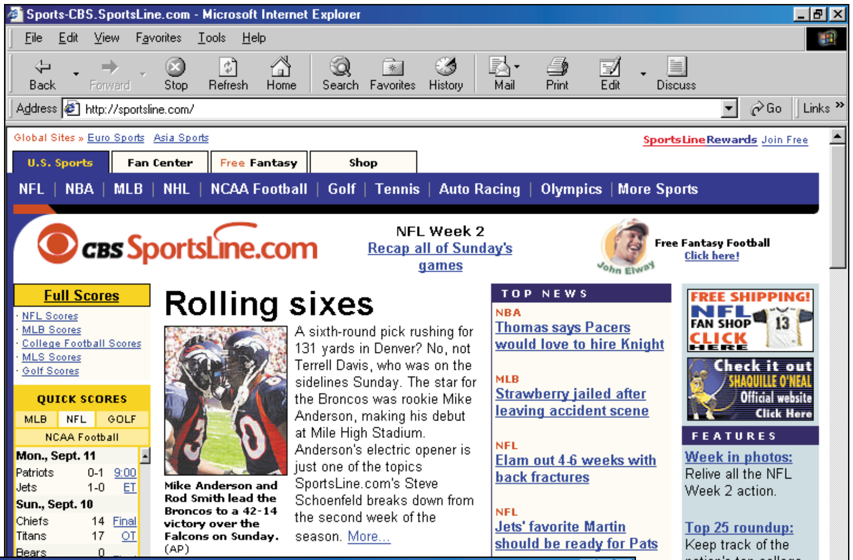
Figure 8-37 Numerous weather, sports, and news Web sites reside on the Internet.

The IBM-run Web site also permitted fans to send e-mail to the 10,500 competitors.

The Internet has emerged as a major source for news, with one-third of Americans going online at least once a week and 15 percent going online daily for reports of major news events. These viewers, who tend to be under the age of 50 and college graduates, are attracted to the Internet's flashy headline format, immediacy, and in-depth reports.

Users are attracted to Web news sites that have a corresponding print or television presence. MSNBC, CNN, ABC News, *USA TODAY*, *The Washington Post*, and *The New York Times* are among the more popular Internet news destinations. The technology content in the Silicon Valley News Web site (Figure 8-39) and crime, justice, and safety news in APBnews.com appeal to users.

For more information on weather, sports, and news sites, visit the Discovering Computers 2002 E-Revolution Web page (scsite.com/dc2002/e-rev.htm) and click Weather, Sports, and News.


Sports-CBS.SportsLine.com - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss
Address http://sportsline.com/
Go Links
Global Sites » Euro Sports Asia Sports
SportsLineRewards Join Free
U.S. Sports Fan Center Free Fantasy Shop
NFL | NBA | MLB | NHL | NCAA Football | Golf | Tennis | Auto Racing | Olympics | More Sports
CBS SportsLine.com
NFL Week 2
Recap all of Sunday's games
Free Fantasy Football
Click here!
John Elway
Full Scores
NFL Scores
MLB Scores
College Football Scores
MLS Scores
Golf Scores
QUICK SCORES
MLB NFL GOLF
NCAA Football
Mon., Sept. 11
Patriots 0-1 9:00
Jets 1-0 ET
Sun., Sept. 10
Chiefs 14 Final
Titans 17 OT
Bears 0
TOP NEWS
NBA
Thomas says Pacers would love to hire Knight
MLB
Strawberry jailed after leaving accident scene
NFL
Elam out 4-6 weeks with back fractures
NFL
Jets' favorite Martin should be ready for Pats
FREE SHIPPING! NFL FAN SHOP CLICK HERE
Check it out SHAQUILLE O'NEAL Official website Click Here
FEATURES
Internet
2:48 PM

Rolling sixes

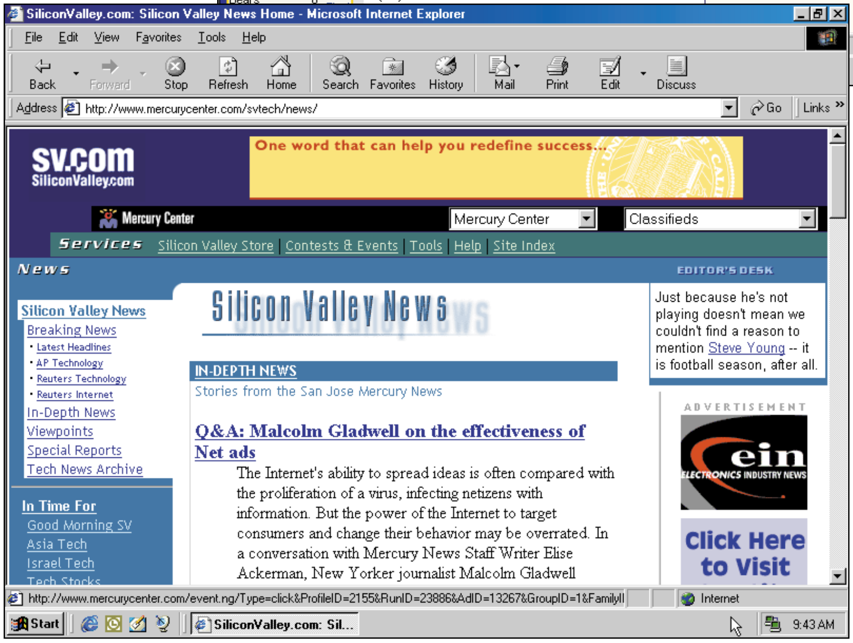
A sixth-round pick rushing for 131 yards in Denver? No, not Terrell Davis, who was on the sidelines Sunday. The star for the Broncos was rookie Mike Anderson, making his debut at Mile High Stadium. Anderson's electric opener is just one of the topics SportsLine.com's Steve Schoenfeld breaks down from the second week of the season. More...

Mike Anderson and Rod Smith lead the Broncos to a 42-14 victory over the Falcons on Sunday. (AP)

Week in photos: Relive all the NFL Week 2 action.

Top 25 roundup: Keep track of the nation's top college teams.

Figure 8-38 Sports fans can catch the latest scores and player profiles on sports Web sites.


SiliconValley.com: Silicon Valley News Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss
Address http://www.mercurycenter.com/svtech/news/
Go Links
SV.com SiliconValley.com
One word that can help you redefine success...
Mercury Center
Mercury Center
Classifieds
Services Silicon Valley Store | Contests & Events | Tools | Help | Site Index
News
EDITOR'S DESK
Silicon Valley News
Breaking News
Latest Headlines
AP Technology
Reuters Technology
Reuters Internet
In-Depth News
Viewpoints
Special Reports
Tech News Archive
In Time For
Good Morning SV
Asia Tech
Israel Tech
Tech Stocks
Silicon Valley News
IN-DEPTH NEWS
Stories from the San Jose Mercury News
ADVERTISEMENT
ein ELECTRONICS INDUSTRY NEWS
Click Here to Visit
http://www.mercurycenter.com/event.ng/Type=click&ProfileID=2155&RunID=23886&AdID=13267&GroupID=1&FamilyI
Internet
Start
SiliconValley.com: Sil...
9:43 AM

Just because he's not playing doesn't mean we couldn't find a reason to mention Steve Young -- it is football season, after all.

Q&A: Malcolm Gladwell on the effectiveness of Net ads

The Internet's ability to spread ideas is often compared with the proliferation of a virus, infecting netizens with information. But the power of the Internet to target consumers and change their behavior may be overrated. In a conversation with Mercury News Staff Writer Elise Ackerman, New Yorker journalist Malcolm Gladwell

Figure 8-39 The Silicon Valley News Web site posts feature stories with details on the ever-changing world of technology.

eREVOLUTION

E-WEATHER E-SPORTS E-NEWS applied:

1. Visit two of the weather Web sites listed in the table in Figure 8-37. Do they contain the same local and five-day forecasts for your city? What similarities and differences do they have in coverage of a national weather story? Next visit two of the sports Web sites in the table and write a paragraph describing the content these Web sites provide concerning your favorite sport.

2. Visit the Online Newspapers and Starting Page Best News Sites Web sites listed in Figure 8-37 and select two newspapers from each site. Write a paragraph describing the top national news story featured in each of these four Web pages. Then, write another paragraph describing the top international news story displayed at each Web site. In the third paragraph, discuss which of the four Web sites is the most interesting in terms of story selection, photographs, and Web page design.

In Summary

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/summary.htm. Click the links for current and additional information. To listen to an audio version of this In Summary, click the Audio button. To play the audio, RealPlayer must be installed on your computer (download by clicking here).

1 What Are the Two Types of System Software?

System software consists of the programs that control the operations of the computer and its devices. System software performs a variety of functions, such as running applications and storing files, and serves as the interface between a user, the application software, and the computer's hardware. The two types of system software are operating systems and utility programs. An operating system (OS) is a set of programs containing instructions to coordinate all of the activities among computer hardware resources. A utility program is a type of system software that performs a specific task, usually related to managing a computer, its devices, or its programs.

2 What Is the Startup Process for a Personal Computer?

Starting a computer involves loading an operating system into memory — a process called **booting**. When the computer is turned on, the power supply sends an electrical signal to devices located in the system unit. The processor chip resets itself and looks for the ROM chip that contains the **BIOS** (**basic input/output system**), which is firmware that holds the startup instructions. The BIOS executes the power-on self test (POST) to make sure hardware is connected properly and operating correctly. Results of the POST are compared with data in a CMOS chip on the motherboard. If the POST is completed successfully, the BIOS looks for **system files**. Once located, the system files load into memory and execute. The boot program next loads the **kernel** of the operating system into memory. The operating system loads system configuration information from the **registry** for each device. The remainder of the operating system is loaded into RAM, the desktop and icons display on the screen, and programs in the **StartUp folder** are executed.

3 What Is a User Interface?

The part of the OS software with which you interact is the **user interface**. Two types of user interfaces are command-line and graphical. With a **command-line interface**, you type keywords or press special keys on the keyboard to enter data and instructions. A graphical user interface (GUI) allows you to use **menus** and visual images such as **icons** and buttons to issue commands. Many of today's GUIs incorporate Web browser-like features.

4 What Are the More Common Features of Operating Systems?

Various capabilities of operating systems are described as single user, multitasking, multiuser, and multiprocessing. A **single user** operating system allows only one user to run one program at a time. A **multitasking** operating system allows a single user to work on two or more applications that reside in memory at the same time. A **multiuser** operating system enables two or more users to run a program simultaneously. A **multiprocessing** operating system can support two or more processors running programs at the same time.

Operating systems manage memory, schedule jobs, configure devices, establish Web connections, monitor system performance, control networks, administer security, and manage storage media and files. **Memory management** optimizes use of random access memory (RAM). Spooling increases efficiency by placing print jobs in a buffer until the printer is ready, freeing the processor for other tasks. A **device driver** is a small program that configures devices by accepting commands and converting them into commands the device understands. **Plug and Play** is the computer's capability of recognizing any new device and assisting in the installation of the device. A **performance monitor** assesses and reports information about various system resources and devices. A type of program called a **file manager** performs functions related to storage and file management.

5

What Is the Difference between Stand-Alone Operating Systems and Network Operating Systems?

A stand-alone operating system is an operating system that works on a desktop or notebook computer. Some stand-alone operating systems, called **client operating systems**, also work in conjunction with a network operating system. A **network operating system** (**NOS**) supports a **network**. In some networks, the **server** controls access to the network hardware and software. **Clients**, which are other computers on the network, rely on the server for resources. The network OS organizes and coordinates how multiple users access and share resources on the network. Most multiuser operating systems administer security by allowing each user to **log on**, which is the process of entering a **user name** and **password**.

6

What Are Some Stand-Alone Operating Systems?

DOS (**Disk Operating System**) refers to several single user, command-line and menu-driven operating systems developed in the early 1980s for personal computers. **Windows 3.x** refers to three early **operating environments** that provided a graphical user interface to work in combination with DOS and simplify its use. **Windows 95** is a true multitasking operating system — not an operating environment. The **Windows 98** operating system is easier to use than Windows 95 and is more integrated with the Internet. Windows 2000 Professional is an upgrade to **Windows NT**, which is an operating system designed for client-server networks. **Windows Millennium Edition** is an updated version of Windows 98 that contains features specifically designed for home computer users. The **Macintosh OS**, a descendant of the first commercially successful graphical user interface, is available only on Macintosh computers. **OS/2 Warp** is IBM's network operating system. **UNIX** is a multitasking operating system developed by scientists at Bell Laboratories. **Linux** is a popular, free, multitasking, UNIX-like operating system.

7

What Are Some Network Operating Systems?

A network OS supports a network and generally resides on a server. Examples of network operating systems include Novel **Netware**; Microsoft **Windows NT Server** and **Windows 2000 Server family**; IBM **OS/2 Warp** and **OS/2Warp Server; UNIX**, which is a **multipurpose operating system**; Linux, which is a multitasking, UNIX-type operating system; and **Solaris™**, a version of UNIX developed by Sun Microsystems specifically for e-commerce applications.

8

What Devices Use Embedded Operating Systems?

Most handheld computers and small devices use an embedded operating system. **Windows CE** is a scaled-down Windows operating system designed for use on wireless communications devices and smaller computers. **Pocket PC OS** is a scaled-down Microsoft operating system that works on a specific type of handheld computer, called a **Pocket PC**. **Palm OS®** is a popular operating system used with handheld computers from Palm, Inc. and Handspring™.

9

What Are Some Common Utility Programs?

A **file viewer** displays the contents of a file. A **file compression utility** reduces the size of a file. A **diagnostic utility** compiles technical information about a computer's hardware and certain system software programs and then prepares a report outlining any identified problems. An **uninstaller** removes an application, as well as any associated entries in the system files. A **disk scanner** detects and corrects problems on a disk and searches for and removes unwanted files. A disk defragmenter reorganizes files and unused space on a computer's hard disk so data can be accessed more quickly and programs can run faster. A **backup utility** copies or backs up selected files or the entire hard drive onto another disk or tape. A **screen saver** causes the monitor's screen to display a moving image on a blank screen if no keyboard or mouse activity occurs for a specific time.

Key Terms

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/terms.htm. Scroll through the list of terms. Click a term to display its definition and a picture. Click the To WEB button for current and additional information about the term from the Web. To see animations, Shockwave and Flash Player must be installed on your computer (download by clicking here).

Active Desktop™ (8.18)
Active Directory (AD) (8.16)
Auto PC (8.26)
background (8.9)
backup utility (8.30)
basic input/output system (8.5)
BIOS (8.5)
boot disk (8.6)
boot drive (8.6)
booting (8.4)
buffer (8.11)
client operating systems (8.17)
clients (8.15)
cold boot (8.4)
command language (8.8)
command-line interface (8.8)
cross-platform (8.4)
defragmenting (8.30)
device-dependent (8.17)
device driver (8.11)
device-independent (8.17)
diagnostic utility (8.28)
disk defragmenter (8.30)
Disk Defragmenter (8.30)
disk scanner (8.29)
DOS (Disk Operating System) (8.17)
downward-compatible (8.17)
Dr. Watson (8.28)
driver (8.11)
embedded operating system (8.25)
emergency repair disk (8.6)
fault-tolerant computer (8.9)
file allocation table (FAT) (8.15)
file compression utility (8.28)
file manager (8.14)
file viewer (8.27)
foreground (8.9)
formatting (8.15)
fragmented (8.30)
ghosting (8.31)
graphical user interface (GUI) (8.8)
icon (8.8)
Imaging Preview (8.27)
Internet Explorer (8.18)
interrupt request (IRQ) (8.13)
job (8.10)
kernel (8.4)
Linux (8.24)
log on (8.16)
Mac OS (8.21)
Macintosh operating system (8.21)
memory management (8.10)
memory resident (8.4)
menu (8.8)
multiprocessing (8.9)
multipurpose operating system (8.24)
multitasking (8.9)
multiuser (8.9)
NetWare (8.22)
network (8.15)
network operating system (8.15)
network OS (8.15)
nonresident (8.4)
NOS (8.15)
NT (8.18)
open-source software (8.24)
operating environment (8.18)
operating system (OS) (8.3)
OS/2 Warp (8.22)
OS/2 Warp Server (8.23)
page (8.10)
paging (8.10)
Palm OS® (8.26)
password (8.16)
performance monitor (8.14)
platform (8.4)
Plug and Play (8.13)
Pocket PC (8.26)
Pocket PC OS (8.26)
power-on self test (POST) (8.6)
print spooler (8.11)
proprietary software (8.17)
queue (8.11)
registry (8.6)
rescue disk (8.6)
restore program (8.30)
screen saver (8.31)
server (8.15)
shortcut (8.14)
single user/single tasking (8.8)
software platform (8.4)
Solaris™ (8.25)
spooling (8.11)
stand-alone operating system (8.17)
StartUp folder (8.6)
swap file (8.10)
system files (8.6)
system software (8.2)
thrashing (8.10)
uncompress (8.28)
uninstaller (8.29)
UNIX (8.23)
unzip (8.28)
upward-compatible (8.17)
user ID (8.16)
user interface (8.7)
user name (8.16)

PALM OS®
An operating system used with handheld computers such as Palm and Visor. (8.26)

utility (8.27)
utility program (8.27)
utility suites (8.27)
virtual memory (VM) (8.10)
warm boot (8.4)
warm start (8.4)
Web-based utility service (8.27)
Windows (8.18)
Windows 2000 Advanced Server (8.22)
Windows 2000 Datacenter Server (8.22)
Windows 2000 Professional (8.18)
Windows 2000 Server (8.22)
Windows 2000 Server family (8.22)
Windows 3.x (8.18)
Windows 95 (8.18)
Windows 98 (8.18)
Windows CE (8.25)
Windows Explorer (8.18)
Windows Me (8.20)
Windows Millennium Edition (8.20)
Windows NT (8.18)
Windows NT Server (8.22)
Windows NT Workstation (8.18)
zipped files (8.28)

Learn It Online

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/learn.htm.

1. Web Guide

Click Web Guide to display the Guide to World Wide Web Sites and Searching Techniques Web page. Click Reference and then click Webopedia. Search for operating systems. Click one of the operating system links. Prepare a brief report on your findings and submit your assignment to your instructor.

2. Scavenger Hunt

Click Scavenger Hunt. Print a copy of the Scavenger Hunt page; use this page to write down your answers as you search the Web. Submit your completed page to your instructor.

3. Who Wants to Be a Computer Genius?

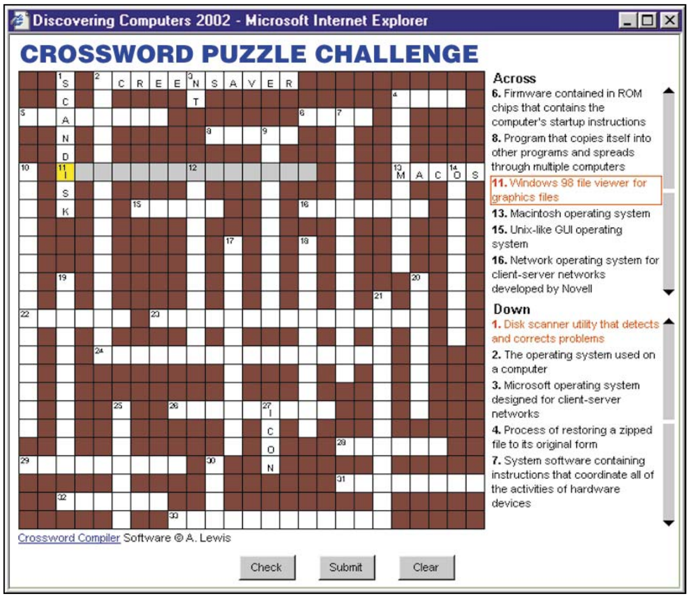
Click Computer Genius to find out if you are a computer genius. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit your score to your instructor.

4. Wheel of Terms

Click Wheel of Terms to reinforce important terms you learned in this chapter by playing the Shelly Cashman Series version of this popular game. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit your score to your instructor.

5. Career Corner

Click Career Corner to display the QuintEssential Careers page. Click one of the tutorial links and complete the tutorial. Prepare a brief report describing what you learned. Submit the report to your instructor.


Discovering Computers 2002 - Microsoft Internet Explorer
CROSSWORD PUZZLE CHALLENGE
Crossword Compiler Software © A. Lewis
Check
Submit
Clear

Across
6. Firmware contained in ROM chips that contains the computer's startup instructions
8. Program that copies itself into other programs and spreads through multiple computers
11. Windows 98 file viewer for graphics files
13. Macintosh operating system
15. Unix-like GUI operating system
16. Network operating system for client-server networks developed by Novell

Down
1. Disk scanner utility that detects and corrects problems
2. The operating system used on a computer
3. Microsoft operating system designed for client-server networks
4. Process of restoring a zipped file to its original form
7. System software containing instructions that coordinate all of the activities of hardware devices

6. Search Sleuth

Click Search Sleuth to learn search techniques that will help make you a research expert. Submit the completed assignment to your instructor.

7. Crossword Puzzle Challenge

Click Crossword Puzzle Challenge. Complete the puzzle to reinforce skills you learned in this chapter. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit the completed puzzle to your instructor.

8. Practice Test

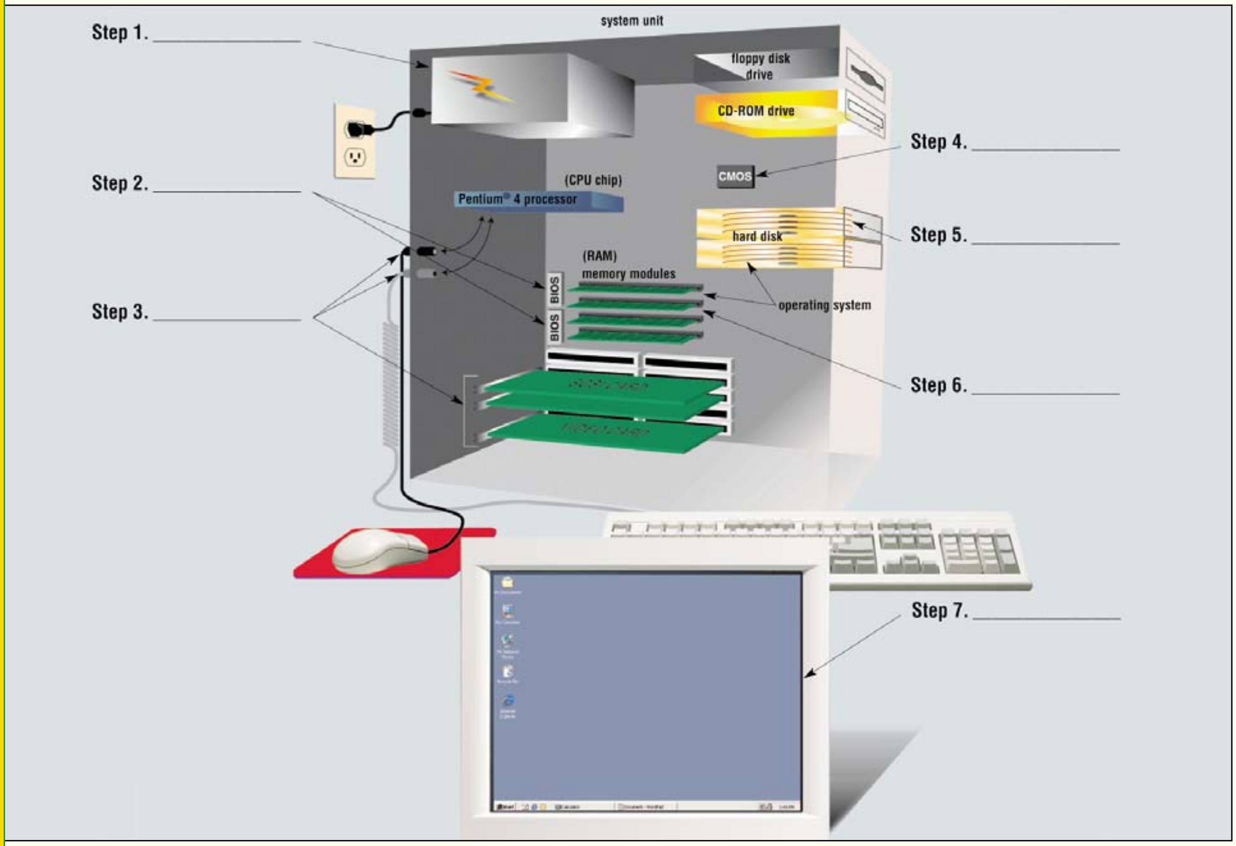
Click Practice Test. Answer each question. When completed, enter your name and click the Grade Test button to submit the quiz for grading. Make a note of any missed questions. If required, print a copy to submit to your instructor.

Checkpoint

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/check.htm. Click the links for current and additional information. To experience the animation and interactivity, Shockwave and Flash Player must be installed on your computer (download by clicking here).

LABEL THE FIGURE

Instructions: Identify each step of how a personal computer boots up.



MATCHING

Instructions: Match each term from the column on the left with the best description from the column on the right.

_______ 1. OS/2 Warp
_______ 2. Windows 2000 Professional
_______ 3. Windows NT
_______ 4. Linux
_______ 5. Windows Me

a. Operating environment that works in combination with an operating system to simplify its use.
b. An operating system designed for client/server networks.
c. An upgrade to Windows 98 that has features specifically for the home user.
d. A complete multitasking client operating system for desktop and notebook business computers.
e. IBM's multitasking client operating system that supports networking, the Internet, Java, and speech recognition.
f. An open-source operating system.

Checkpoint

MULTIPLE CHOICE

Instructions: Select the letter of the correct answer for each of the following questions.

1. The two types of system software include operating systems and ___________ .
   a. file viewers
   b. utility services
   c. utility programs
   d. compression programs
2. Stand-alone operating systems that work in conjunction with a network operating system are called ___________ .
   a. client operation systems
   b. DOS
   c. Linux
   d. operating environments
3. One weakness of the ___________ operating system is its command-line interface.
   a. Mac OS
   b. OS/2 Warp
   c. UNIX
   d. Windows 2000 Professional
4. An embedded operating system usually resides on a ___________ .
   a. hard drive
   b. ROM chip
   c. RAM chip
   d. removable disk
5. A ___________ combines several utility programs into a single package.
   a. utility service
   b. zipped file
   c. disk scanner
   d. utility suite

SHORT ANSWER

Instructions: Write a brief answer to each of the following questions.

1. How is a command-line interface different from a graphical user interface? ___________ Why is a graphical user interface described as user-friendly? ___________ List two operating systems with graphical user interfaces and two with command-line interfaces. ___________
2. What are networking operating systems? ___________ How are networking operating systems different from stand-alone operating systems? ___________
3. How is a single user operating system different from a multiuser operating system? ___________ How is a multitasking operating system different from a multiprocessing operating system? ___________
4. What is a boot disk? ___________ Why is it important to have a boot disk available? ___________
5. What is a file compression utility? ___________ When and why would you use a file compression utility program? ___________ What are some other utility programs you would find useful? ___________

WORKING TOGETHER

Instructions: Working with a group of your classmates, complete the following team exercise.

You and your group have been hired as consultants for ABC Importing. ABC has offices throughout the world — each using a multitude of different operating systems. Many times, it is very difficult to transfer data and information among these systems. ABC's CEO would like your consulting group to recommend a solution for this problem. Prepare a written report and a PowerPoint presentation explaining your solution. Share your report and presentation with your class.

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/lab.htm. Click the links for current and additional information.

1

About Windows

This exercise uses Windows 98 procedures. Double-click the My Computer icon on the desktop. When the My Computer window displays, click Help on the menu bar and then click About Windows 98. Answer the following questions:

- To whom is Windows licensed?
- How much physical memory is available to Windows?
- What percent of the system resources are free?

Click the OK button in the About Windows dialog box. Close the My Computer window.

Using a Screen Saver

2

Right-click an empty area on the desktop and then click Properties on the shortcut menu. When the Display Properties dialog box displays, click the Screen Saver tab. Click the Screen Saver box arrow and then click Mystify Your Mind or any other selection. Click the Preview button to display the actual screen saver. Move the mouse to make the screen saver disappear. Answer the following questions:

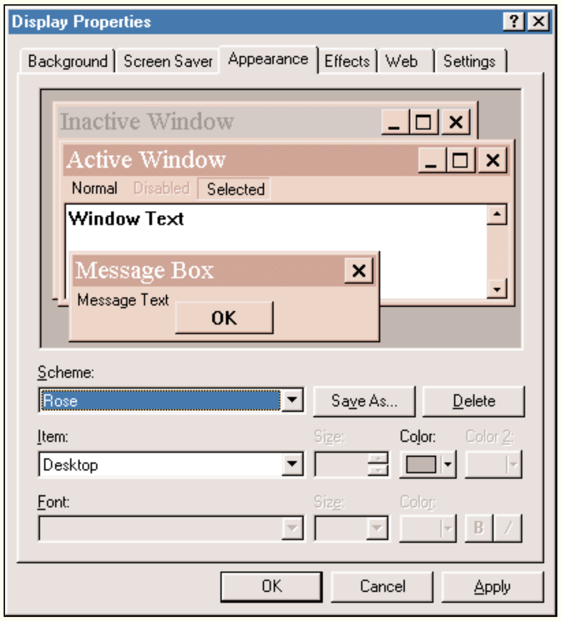
- How many screen savers are available in your Screen Saver list?
- How many minutes does your system wait before activating a screen saver?

Click the Cancel button in the Display Properties dialog box.

3

Changing Desktop Colors

Right-click an empty area on the desktop and then click Properties on the shortcut menu. When the Display Properties dialog box displays, click the Appearance tab. Perform the following tasks: (1) Click the Question Mark button on the title bar and then click the Scheme box. When the pop-up window displays, right-click it. Click Print Topic on the shortcut menu and then click the OK button in the Print dialog box. Click anywhere to remove the pop-up window.
(2) Click the Scheme box arrow and then click Rose to display the Rose color scheme shown in Figure 8.40. Select a color scheme you like. Click the Cancel button in the Display Properties dialog box.


Display Properties

Scheme: Rose

Item: Desktop

Figure 8-40

Customizing the Desktop for Multiple Users

4

This exercise uses Windows 98 procedures. If more than one person uses a computer, how can you customize the desktop for each user? Click the Start button on the taskbar and then click Help on the Start menu. Click the Contents tab. Click the Exploring Your Computer book. Click The Windows Desktop book. Click the Customizing for Multiple Users book. Click an appropriate Help topic and read the information to answer each of the following questions:

- How can you display a list of users at startup?
- How can you add personalized settings for a new user?
- How can you change desktop settings for multiple users?

Click the Close button to close the Windows Help window.

Web Work

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch8/web.htm. To view At The Movies in exercise 1, RealPlayer must be installed on your computer (download by clicking here). To use the Shelly Cashman Series Evaluating Operating Systems Lab and Working at Your Computer Lab from the Web, Shockwave and Flash Player must be installed on your computer (download by clicking here).

Linux Gets Personal

To view the Linux Gets Personal movie, click the button to the left or click the Play button to the right. Watch the movie, and then complete the exercise by answering the question below. It looks like Microsoft Windows has some meaningful competition. The Linux operating system has shown itself to be easy to transition to from Windows, apparently more reliable in networking situations, and, at the price of free, it decidedly is less expensive. Though Linux is free, aligned companies make their money by providing customization services and selling new applications. Major companies, including IBM, Compaq, and HP, have formed an alliance to develop desktop office software that competes with Microsoft. Is Linux a boon to, or will it just complicate things for, computer users?

Shelly Cashman Series Evaluating Operating Systems Lab

Follow the instructions in Web Work 2 on page 1.47 to start and use the Shelly Cashman Series Evaluating Operating Systems Lab. If you are running from the Web, enter the URL, www.scsite.com/ sclabs/menu.htm; or display the Web Work Web page (see instructions at the top of this page) and then click the button to the left.

Shelly Cashman Series Working at Your Computer Lab

Follow the instructions in Web Work 2 on page 1.47 to start and use the Shelly Cashman Series Working at Your Computer Lab. If you are running from the Web, enter the URL, www.scsite.com/sclabs/menu.htm; or display the Web Work Web page (see instructions at the top of this page) and then click the button to the left.

A Picture's Worth a Thousand Words

Although she is not a programmer, Susan Kare's impact on the modern graphical user interface has been substantial. Kare is the person responsible for many of the icons used in modern graphical interfaces. According to Forbes magazine, "When it comes to giving personality to what otherwise might be cold and uncaring office machines, Kare is the queen of look and feel." Click the button to the left to learn more about Susan Kare and her approach to developing icons.

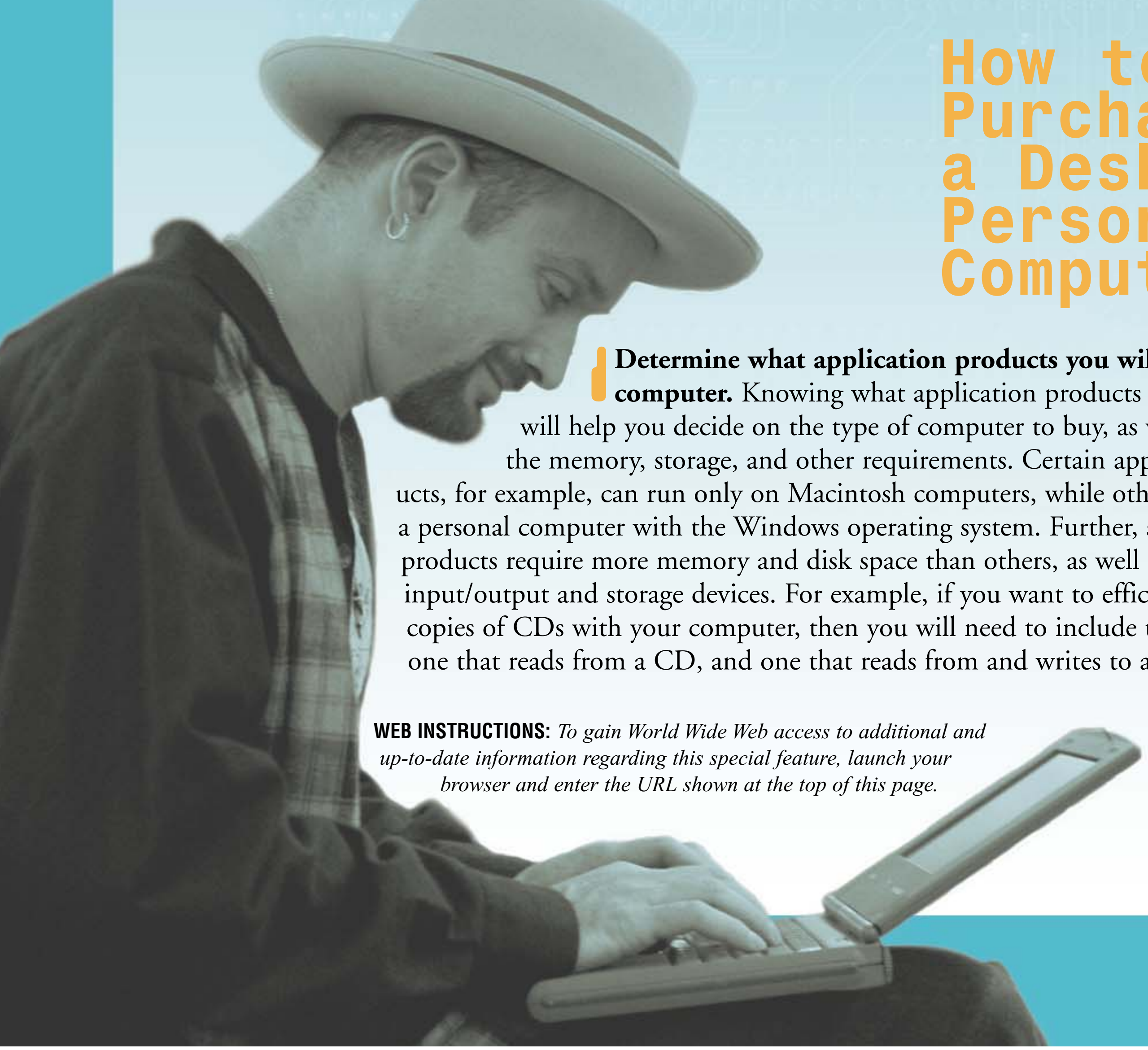
In the News

When Windows 2000 was launched in March 2000, hundreds queued up at computer outlets. It is unclear, however, whether the anticipation was caused by the new operating system or by the promotions many dealers offered — one vendor gave computer buyers the chance also to purchase a computer for $20. Click the button to the left and read a news article about the impact, quality, or promotion of an operating system. What operating system was it? What was done to sell the operating system? Is the operating system recommended? Why or why not?

The decision to buy a personal computer is an important one — and finding and purchasing a personal computer suited to your needs will require an investment of both time and money. As with many buyers, you may have little computer experience and find yourself unsure of how to proceed. The following guidelines are presented to help you purchase, install, and maintain a desktop computer. These guidelines also apply to the purchase of a notebook computer or handheld computer. Purchasing a notebook computer or handheld computer also involves some additional considerations, which are addressed later in this special feature.

Buyer's Guide 2002

How to Purchase, Install, and Maintain a Personal Computer



How to Purchase a Desktop Personal Computer

1 **Determine what application products you will use on your computer.** Knowing what application products you plan to use will help you decide on the type of computer to buy, as well as to define the memory, storage, and other requirements. Certain application products, for example, can run only on Macintosh computers, while others run only on a personal computer with the Windows operating system. Further, some application products require more memory and disk space than others, as well as additional input/output and storage devices. For example, if you want to efficiently create copies of CDs with your computer, then you will need to include two CD drives: one that reads from a CD, and one that reads from and writes to a CD.

WEB INSTRUCTIONS: *To gain World Wide Web access to additional and up-to-date information regarding this special feature, launch your browser and enter the URL shown at the top of this page.*

When you purchase a computer, it may come bundled with several software products. At the very least, you probably will want software for word processing and a browser to access the World Wide Web. If you need additional applications, such as a spreadsheet, a database, or presentation graphics, consider purchasing a software suite that offers reduced pricing on several applications, such as Microsoft Works or Microsoft Office.

Before selecting a specific package, be sure the software contains the features necessary for the tasks you want to perform. Many Web sites and magazines, such as those listed in Figure 1, provide reviews of software products. These Web sites frequently have articles that rate computers and software on cost, performance, and support.

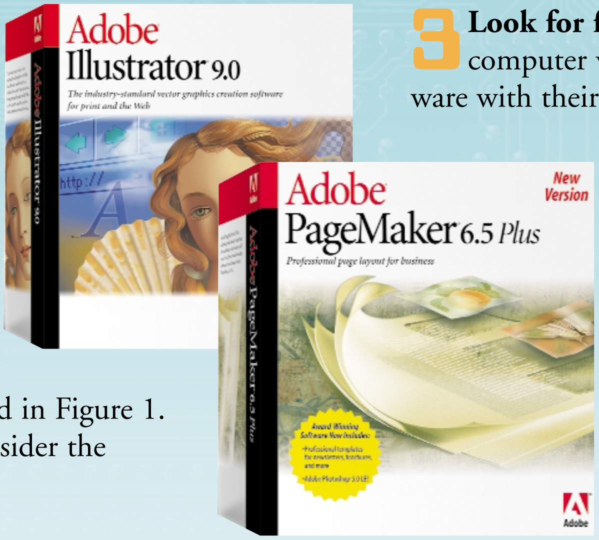
Type of Computer	Web Site	URL
PC	Computer Shopper	zdnet.com/computershopper/edit/howtobuy
	PC World Magazine	pcworld.com
	Byte Magazine	byte.com
	Smart Business for New Economy	zdnet.com/smartbusinessmag/
	PC Magazine	zdnet.com/pcmag
	Yahoo! Computers	computers.yahoo.com
	FamilyPC Magazine	familypc.zdnet.com
	Microsoft Network	eshop.msn.com
	Dave's Guide to Buying a PC	css.msu.edu/pc-guide.html
Macintosh	TechWeb News	www.techweb.com/wire/apple
	ZDNet News	zdnet.com/mac
	Macworld Magazine	macworld.zdnet.com
	Apple	apple.com

For an updated list of hardware and software reviews and their Web sites, visit scsite.com/dc2002/ch8/buyers.htm.

Figure 1 Hardware and software reviews.

2 **Before buying a computer, do some research.** Talk to friends, coworkers, and instructors about prospective computers. What type of computers did they buy? Why? Would they recommend their computer and the company from which they bought it? You also should visit the Web sites or read reviews in the magazines listed in Figure 1. As you conduct your research, consider the following important criteria:

- Speed of the processor
- Size and types of memory (RAM) and storage (hard disk, floppy disk, CD-ROM, CD-RW, DVD-ROM, Zip® drive)
- Input/output devices included with the computer (e.g., mouse, keyboard, monitor, printer, sound card, video card)
- Communications devices included with the computer (modem, network interface card)
- Any software included with the computer


Adobe
Illustrator 9.0
The industry-standard vector graphics creation software for print and the Web
Adobe
PageMaker 6.5 Plus
New Version
Professional page layout for business
Adobe

3 **Look for free software.** Many computer vendors include free software with their systems. Some sellers even let you choose which software you want. Remember, however, that free software has value only if you would have purchased the software even if it had not come with the computer.

4 **If you are buying a new computer, you have several purchasing options: buying from your school bookstore, a local computer dealer, a local large retail store, or ordering by mail via telephone or the World Wide Web.** Each purchasing option has certain advantages. Many college bookstores, for example, sign exclusive pricing agreements with computer manufacturers and, thus, can offer student discounts. Local dealers and local large retail stores, however, more easily can provide hands-on support. Mail-order companies

that sell computers by telephone or online via the Web (Figure 2) often provide the lowest prices but extend less personal service. Some major mail-order companies, however, have started to provide next-business-day, onsite services. A credit card usually is required to buy from a mail-order company. Figure 3 lists some of the more popular mail-order companies and their Web site addresses.

Gateway.com Consumer Homepage - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss
Address http://gateway.com/home/index.shtml
Go Links
Gateway People Rule.
order a new PC online and save $50
retrieve quote • order status • financing • search • help
Home & Student Learning Zone
Customized Solutions
Accessory Store
Software Store
Build & Buy Your Gateway PC
Order online and save $50 today. More Details
Notebooks from $999
Desktops from $799
Handheld Solutions from $299
Hot Deals
As Advertised
Referral Rewards
Gateway Affiliates
Gift Guide for PCs
Gateway Solo® 1150cs
Recent Price Drop! now only $999
Gateway™ Select 1000 only $1599
Gateway™ Performance 866 from $1299

Figure 2 Some mail-order companies, like Gateway, sell computers online.

Type of Computer	Company	URL	Telephone Number
PC	Computer Shopper	computershopper.com	Not Available
	Compaq	compaq.com	1-800-888-0220
	CompUSA	compusa.com	1-800-266-7872
	dartek.com	dartek.com	1-800-531-4622
	Dell	dell.com	1-800-678-1626
	Gateway	gateway.com	1-800-846-4208
	Micron	micron.com	1-800-964-2766
Macintosh	Apple Computer	store.apple.com	1-800-795-1000
	Club Mac	www.clubmac.com	1-800-258-2622
	MacConnection	macconnection.com	1-888-213-0260
	MacExchange	macx.com	1-888-650-4488

For an updated list of new computer mail-order companies and their Web sites, visit scsite.com/dc2002/ch8/buyers.htm.

Figure 3 New computer mail-order companies.

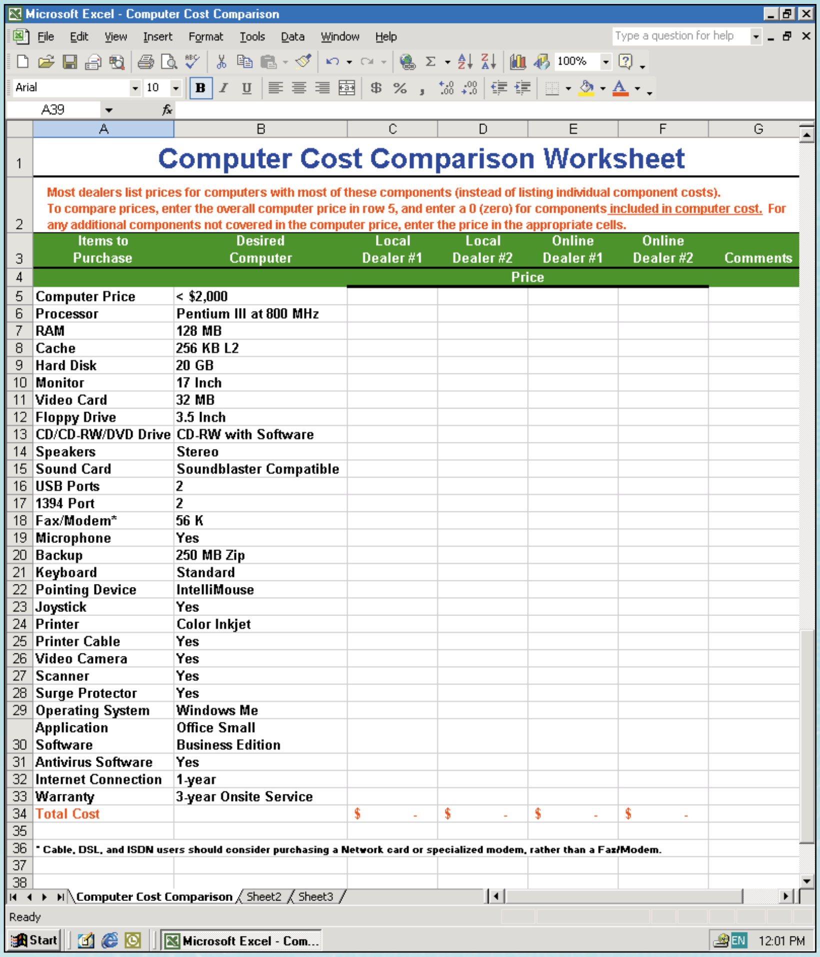
5 If you are buying a used computer, stick with name brands. Although brand-name equipment can cost more, most brand-name computers have longer, more comprehensive warranties, are better supported, and have more authorized centers for repair services. As with new computers, you can purchase a used computer from local computer dealers, local large retail stores, or mail order via the telephone or the Web. Classified ads and used computer brokers offer additional outlets for purchasing used computers. Figure 4 lists several major used computer brokers and their Web site addresses.

Company	URL	Telephone Number
American Computer Exchange	www.amcoex.com	1-800-786-0717
Custom Edge, Inc.	bocoex.com	1-617-625-7722
U.S. Computer Exchange, Inc.	www.uscomputerexchange.com	1-800-711-9000
eBay	ebay.com	Not Available

For an updated list of used computer mail-order companies and their Web sites, visit *scsite.com/dc2002/ch8/buyers.htm*.

Figure 4 Used computer mail-order companies.

6 Use a worksheet to compare computers, services, and other considerations. You can use a separate sheet of paper to take notes on each vendor's computer and then summarize the information on a spreadsheet, such as the one shown in Figure 5. Most companies advertise a price for a base computer that includes components housed in the system unit (processor, RAM, sound card, video card), disk drives (floppy disk, hard disk, CD-ROM, CD-RW, and DVD-ROM), a keyboard, mouse, monitor, printer, speakers, and modem. Be aware, however, that some advertisements list prices for computers with only some of these components. Monitors, printers, and modems, for example, often are not included in a base computers price. Depending on how you plan to use the computers, you may want to invest in additional or more powerful components. When you are comparing the prices of computers, make sure you are comparing identical or similar configurations.



Computer Cost Comparison Worksheet

Most dealers list prices for computers with most of these components (instead of listing individual component costs). To compare prices, enter the overall computer price in row 5, and enter a 0 (zero) for components included in computer cost. For any additional components not covered in the computer price, enter the price in the appropriate cells.

Items to Purchase	Desired Computer	Local Dealer #1	Local Dealer #2	Online Dealer #1	Online Dealer #2	Comments
		Price				
Computer Price	< $2,000					
Processor	Pentium III at 800 MHz					
RAM	128 MB					
Cache	256 KB L2					
Hard Disk	20 GB					
Monitor	17 Inch					
Video Card	32 MB					
Floppy Drive	3.5 Inch					
CD/CD-RW/DVD Drive	CD-RW with Software					
Speakers	Stereo					
Sound Card	Soundblaster Compatible					
USB Ports	2					
1394 Port	2					
Fax/Modem*	56 K					
Microphone	Yes					
Backup	250 MB Zip					
Keyboard	Standard					
Pointing Device	IntelliMouse					
Joystick	Yes					
Printer	Color Inkjet					
Printer Cable	Yes					
Video Camera	Yes					
Scanner	Yes					
Surge Protector	Yes					
Operating System	Windows Me					
Application Software	Office Small Business Edition					
Antivirus Software	Yes					
Internet Connection	1-year					
Warranty	3-year Onsite Service					
Total Cost		$ -	$ -	$ -	$ -	

* Cable, DSL, and ISDN users should consider purchasing a Network card or specialized modem, rather than a Fax/Modem.

Figure 5 A spreadsheet is an effective tool for summarizing and comparing the prices and components of different computer vendors. A copy of the Computer Cost Comparison Worksheet is on the Discover Data Disk. To obtain a copy of the Discover Data Disk, see the inside back cover of this book for instructions.

8 **Consider more than just price.** The lowest cost computer may not be the best buy. Consider such intangibles as the vendor's time in business, the vendor's regard for quality, and the vendor's reputation for support. If you need to upgrade your computer often, you may want to consider a leasing arrangement, in which you pay monthly lease fees but upgrade or add on to your computer as your equipment needs change. If you are a replacement buyer, ask if the vendor will buy your old computer; an increasing number of companies are taking trade-ins. No matter what type of buyer you are, insist on a 30-day, no questions-asked return policy on your computer.

7 **Be aware of hidden costs.** Before purchasing, be sure to consider any additional costs associated with buying a computer, such as an additional telephone line, an uninterruptible power supply (UPS), computer furniture, floppy disks and paper, or computer training classes you may want to take. Depending on where you buy your computer, the seller may be willing to include some or all of these in the computer purchase price.

9 **Avoid restocking fees.** Some companies charge a restocking fee of 10 to 20 percent as part of their money-back return policy. In some cases, there is no restocking fee for hardware, but there is for software. Ask about the existence and terms of any restocking policies before you buy.

10 **Select an Internet service provider (ISP) or online service provider (OSP).** You can access the Internet in one of two ways: via an ISP or an OSP. Both provide Internet access for a monthly fee that ranges from $5 to $20. Some OSPs offer free Internet access. Local ISPs offer Internet access through local telephone numbers to users in a limited geographic region. National ISPs provide access for users nationwide (including mobile users), through local and toll-free telephone numbers and cable. Because of their size, national ISPs offer more services and generally have a larger technical support staff than local ISPs. OSPs furnish Internet access as well as members-only features for users nationwide. Figure 6 lists several national ISPs and OSPs. Before you choose an Internet access provider, compare such features as the number of access hours, monthly fees, available services (e-mail, Web page hosting, chat), and reliability.

Company	Service	URL	Telephone Number
America Online	OSP	aol.com	1-800-827-6364
AT&T Data and IP Services	ISP	att.com/wss	1-800-288-3199
CompuServe	OSP	compuserve.com	1-800-848-8990
Earthlink Network	ISP	www.earthlink.com	1-800-395-8425
Juno	Free OSP	juno.com	1-888-829-5866
MCI	ISP	mciworldcom.com	1-800-888-0800
Microsoft Network	OSP	msn.com	1-800-386-5550
NetZero	Free OSP	netzero.com	Not Available
Prodigy	ISP/OSP	prodigy.com	1-800-776-3449

For information on local ISPs or to learn more on any ISPs and OSPs listed here, visit The List™ at thelist.internet.com. The List™ — the most comprehensive and accurate directory of ISPs and OSPs on the Web — compares dial-up services, access hours, and fees for over 9,000 access providers.

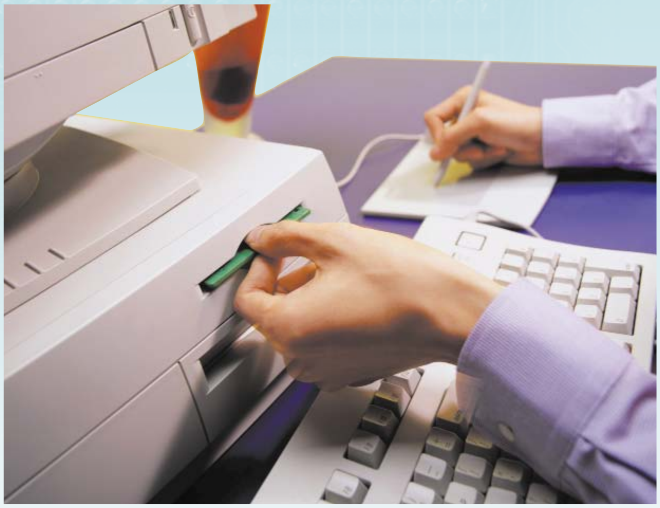
For an updated list of ISPs and OSPs, visit *scsite.com/dc2002/ ch8/buyers.htm*.

Figure 6 National ISPs and OSPs.

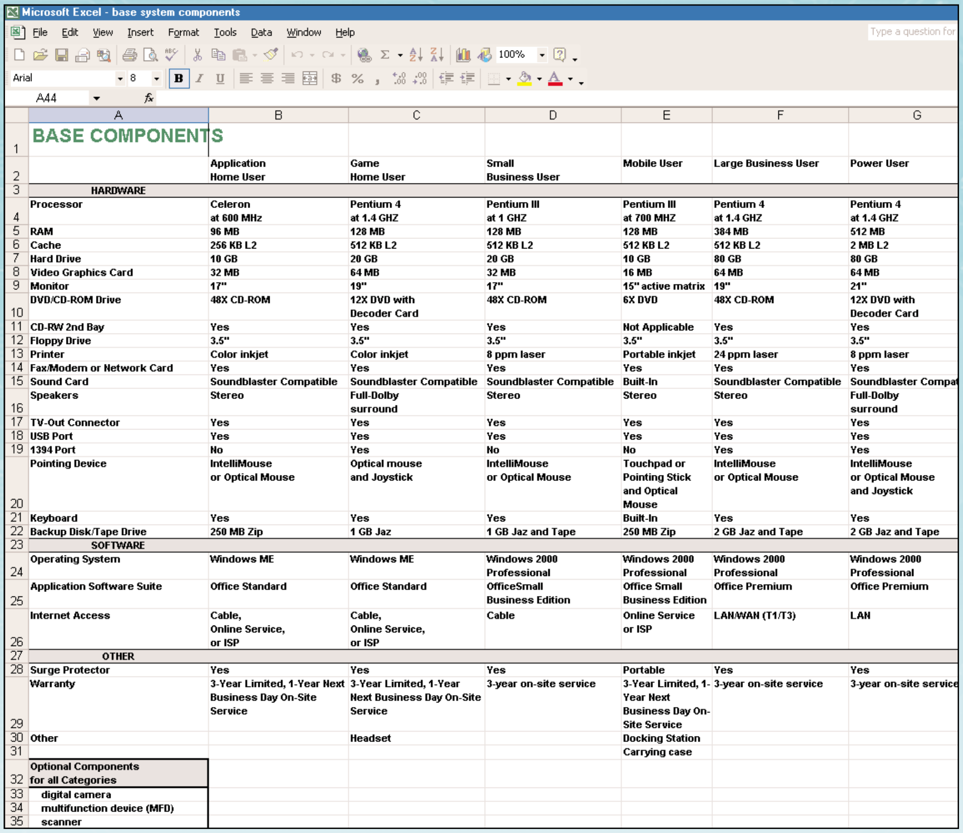
11 **Buy a computer compatible with the ones you use elsewhere.** If you use a personal computer at work or in some other capacity, make sure the computer you buy is compatible. For example, if you use a PC at work, you may not want to purchase a Macintosh for home use. Having a computer compatible with the ones at work or school will allow you to transfer files and spend time at home on work- or school-related projects.

12 **Consider purchasing an onsite service agreement.** If you use your computer for business or are unable to be without your computer, consider purchasing an onsite service agreement through a local dealer or third-party company. Most onsite service agreements state that a technician will come to your home, work, or school within 24 hours. If your computer includes onsite service only for the first year, think about extending the service for two or three years when you buy the computer.

13 **Use a credit card to purchase your new computer.** Many credit cards now offer purchase protection and extended warranty benefits that cover you in case of loss of or damage to purchased goods. Paying by credit card also gives you time to install and use the computer before you have to pay for it. Finally, if you are dissatisfied with the computer and are unable to reach an agreement with the seller, paying by credit card gives you certain rights regarding withholding payment until the dispute is resolved. Check your credit card for specific details.



14 **Avoid buying the smallest computer available.** Computer technology changes rapidly, meaning a computer that seems powerful enough today may not serve your computing needs in a few years. In fact, studies show that many users regret they did not buy a more powerful computer. Plan to buy a computer that will last you for two to three years. You can help delay obsolescence by purchasing the fastest processor, most memory, and largest hard drive you can afford. If you must buy a smaller computer, be sure you can upgrade it with additional memory and auxiliary devices as your computer requirements grow. Figure 7 includes minimum recommendations for each category of user discussed in this book: Home User, Small Business User, Mobile User, Large Business User, and Power User. The Home User category is divided into two groups: Application Home User and Game Home User.


Microsoft Excel - base system components
File Edit View Insert Format Tools Data Window Help
Type a question for
100%
Arial
8
A44

	A	B	C	D	E	F	G
1	BASE COMPONENTS						
2		Application Home User	Game Home User	Small Business User	Mobile User	Large Business User	Power User
3	HARDWARE						
4	Processor	Celeron at 600 MHz	Pentium 4 at 1.4 GHZ	Pentium III at 1 GHZ	Pentium III at 700 MHZ	Pentium 4 at 1.4 GHZ	Pentium 4 at 1.4 GHZ
5	RAM	96 MB	128 MB	128 MB	128 MB	384 MB	512 MB
6	Cache	256 KB L2	512 KB L2	512 KB L2	512 KB L2	512 KB L2	2 MB L2
7	Hard Drive	10 GB	20 GB	20 GB	10 GB	80 GB	80 GB
8	Video Graphics Card	32 MB	64 MB	32 MB	16 MB	64 MB	64 MB
9	Monitor	17"	19"	17"	15" active matrix	19"	21"
10	DVD/CD-ROM Drive	48X CD-ROM	12X DVD with Decoder Card	48X CD-ROM	6X DVD	48X CD-ROM	12X DVD with Decoder Card
11	CD-RW 2nd Bay	Yes	Yes	Yes	Not Applicable	Yes	Yes
12	Floppy Drive	3.5"	3.5"	3.5"	3.5"	3.5"	3.5"
13	Printer	Color inkjet	Color inkjet	8 ppm laser	Portable inkjet	24 ppm laser	8 ppm laser
14	Fax/Modem or Network Card	Yes	Yes	Yes	Yes	Yes	Yes
15	Sound Card	Soundblaster Compatible	Soundblaster Compatible	Soundblaster Compatible	Built-In	Soundblaster Compatible	Soundblaster Compat
16	Speakers	Stereo	Full-Dolby surround	Stereo	Stereo	Stereo	Full-Dolby surround
17	TV-Out Connector	Yes	Yes	Yes	Yes	Yes	Yes
18	USB Port	Yes	Yes	Yes	Yes	Yes	Yes
19	1394 Port	No	Yes	No	No	Yes	Yes
20	Pointing Device	IntelliMouse or Optical Mouse	Optical mouse and Joystick	IntelliMouse or Optical Mouse	Touchpad or Pointing Stick and Optical Mouse	IntelliMouse or Optical Mouse	IntelliMouse or Optical Mouse and Joystick
21	Keyboard	Yes	Yes	Yes	Built-In	Yes	Yes
22	Backup Disk/Tape Drive	250 MB Zip	1 GB Jaz	1 GB Jaz and Tape	250 MB Zip	2 GB Jaz and Tape	2 GB Jaz and Tape
23	SOFTWARE						
24	Operating System	Windows ME	Windows ME	Windows 2000 Professional	Windows 2000 Professional	Windows 2000 Professional	Windows 2000 Professional
25	Application Software Suite	Office Standard	Office Standard	OfficeSmall Business Edition	Office Small Business Edition	Office Premium	Office Premium
26	Internet Access	Cable, Online Service, or ISP	Cable, Online Service, or ISP	Cable	Online Service or ISP	LAN/WAN (T1/T3)	LAN
27	OTHER						
28	Surge Protector	Yes	Yes	Yes	Portable	Yes	Yes
29	Warranty	3-Year Limited, 1-Year Next Business Day On-Site Service	3-Year Limited, 1-Year Next Business Day On-Site Service	3-year on-site service	3-Year Limited, 1-Year Next Business Day On-Site Service	3-year on-site service	3-year on-site service
30	Other		Headset		Docking Station		
31					Carrying case		
32	Optional Components for all Categories						
33	digital camera						
34	multifunction device (MFD)						
35	scanner						

Figure 7 Base computer components and optional components. A copy of the BASE COMPONENTS worksheet is on the Discover Data Disk. To obtain a copy of the Discover Data Disk, see the inside back cover of this book for instructions.

How to Purchase a Notebook Computer

If you need computing capability when you travel, you may find a notebook computer to be an appropriate choice. The guidelines mentioned in the previous section also apply to the purchase of a notebook computer (Figure 8). The following are additional considerations unique to notebook computers.

Figure 8 A notebook computer.

1 Purchase a notebook computer with a sufficiently large active-matrix screen. Active-matrix screens display high-quality color that is viewable from all angles. Less expensive, passive-matrix screens sometimes are difficult to see in low-light conditions and cannot be viewed from an angle. Notebook computers typically come with a 12.1-inch, 13.3-inch, 14.1-inch, or 15.4-inch display. For most users, a 14.1-inch display is satisfactory. If you intend to use your notebook computer as a desktop replacement, however, you may opt for a 15.4-inch display. If you travel a lot and portability is essential, consider that most of the lightest machines are equipped with a 13.3-inch display. Regardless of size, the resolution of the display should be at least 800 x 600 pixels.

2 Experiment with different pointing devices and keyboards. Notebook computer keyboards are far less standardized than those for desktop computers. Some notebook computers, for example, have wide wrist rests, while others have none. Notebook computers also use a range of pointing devices, including pointing sticks, touchpads, and trackballs. Before you purchase a notebook computer, try various types of keyboard and pointing devices to determine which is easiest for you to use. Regardless of the pointing device you select, you also may want to purchase a regular mouse unit to use when you are working at a desk or other large surface.

3 Make sure the notebook computer you purchase has a CD-ROM or DVD-ROM drive. Loading software, especially large software suites, is much faster if done from a CD-ROM, CD-RW, or DVD-ROM. Today, most notebook computers come with an internal CD-ROM drive. Some notebook computers even come with a CD-ROM drive and a CD-RW drive or both a DVD-ROM drive and a CD-RW drive. Some users prefer a DVD-ROM drive to a CD-ROM drive. Although DVD-ROM drives are more expensive, they allow you to read CD-ROMs and to play movies using your notebook computer.

4 If necessary, upgrade memory and disk storage at the time of purchase. As with a desktop computer, upgrading your notebook computer's memory and disk storage usually is less expensive at the time of initial purchase. Some disk storage is custom designed for notebook computer manufacturers, meaning an upgrade might not be available a year or two after you purchase your notebook computer.

5 If you are going to use your notebook computer on an airplane, purchase a second battery. Two batteries should provide enough power to last through most airplane flights. If you anticipate running your notebook computer on batteries frequently, choose a computer that uses lithium-ion batteries (they last longer than nickel cadmium or nickel hydride batteries).

6 Purchase a well-padded and well-designed carrying case. An amply padded carrying case will protect your notebook computer from the bumps it will receive while traveling. A well-designed carrying case will have room for accessories such as spare floppy disks, CD-ROMs, a user manual, pens, and paperwork (Figure 9).

Figure 9 Well-designed carrying case.

7 If you travel overseas, obtain a set of electrical and telephone adapters. Different countries use different outlets for electrical and telephone connections. Several manufacturers sell sets of adapters that will work in most countries (Figure 10).

Figure 10 Set of electrical and telephone adapters.

8 If you plan to connect your notebook computer to a video projector, make sure the notebook computer is compatible with the video projector. Some notebook computers will not allow you to display an image on the notebook computer and projection device at the same time (Figure 11). Either of these factors can affect your presentation negatively.

Figure 11 Video projector.

How to Purchase a Handheld Computer

Figure 12 Palm V with Palm OS.

Figure 13 Compaq iPaq Pocket PC.

If you need to stay organized when you are on the go, then a lightweight, palm-size or pocketsize computer, called a handheld computer, may be the right choice. Handheld computers typically are categorized by the operating system they run. Although several are available, the two primary operating systems are Palm OS (Figure 12) and Pocket PC (Figure 13). Listed in this section are a few points you will want to consider when purchasing a handheld computer. You also should visit the Web sites listed in Figure 14.

1 **Determine the applications you plan to run on your handheld computer.** All handheld computers can handle basic organizer-type applications, such as calendar, address book, and notepad. The availability of other applications is dependent on the operating system you choose. With more than 5,000 applications, the depth of software applications for the Palm OS is unmatched. Handheld computers that run Pocket PC have fewer applications available, but they do run a Windows-like operating system and applications you probably are familiar with, such as Word and Excel.

2 **What do you want to pay?** The price of handheld computers runs from $100 to $1,000, depending on their capabilities. In general, Palm OS devices are at the lower end of the cost spectrum and Pocket PC devices are at the higher end. The average selling price for handheld computers is in the $300 to $500 range. For the latest handheld computer prices, capabilities, and accessories, visit the Web sites listed in Figure 14.

Web Site	URL
Compaq	compaq.com/products/handhelds
Computer Shopper	computershopper.com
Handspring	handspring.com
Microsoft	pocketpc.com
Mobile Computing	mobilecomputing.com
Palm	palm.com
PDA Buyers Guide	pdabuyersguide.com
smaller.com	smaller.com
Wireless Developer Network	wirelessdevnet.com

For an updated list of handheld computer Web sites, visit *scsite.com/dc2002/ch8/buyers.htm*.

Figure 14 Reviews and information on handheld computers.

3 **Practice with the touch screen and handwriting recognition before deciding on a model.** You use a pen-like stylus to handwrite on the screen. The handheld computer then translates the handwriting into a computerized font. You also can use the stylus as a pointing device to select items on the screen and enter data using a transparent on-screen key board. Some handheld computers are easier to use than others. You can buy third-party software to improve a handheld computer's handwriting recognition.

4 **Decide if you want a color screen.** Pocket PC devices have color screens (as many as 65,536 colors), while most Palm OS devices have monochrome screens (4 to 16 shades of gray). More colors result in greater detail. Resolution also influences the quality of the display.

5 **Compare battery life.** Any mobile device is good only if it has the power to run. Palm OS devices with black-and-white screens tend to have a much longer battery life than Pocket PC devices with color screens. To help alleviate this problem, both Palm OS and Pocket PC devices have incorporated rechargeable batteries, but this only works if you are near a recharger.

6 **Check out the accessories.** You need to consider what accessories you want for your handheld computer. Handheld computer accessories include carrying cases, portable keyboards, removable storage, car chargers, GPS systems, dashboard mounts, replacement styli, synchronization cradles and cables, and more.

7 **Decide if you want additional functionality.** You will find that off-the-shelf Pocket PC devices have broader functionality than Palm OS devices. For example, voice-recording capability, e-book player, MP3 (music) player, and video player are standard on most Pocket PC devices. If you are leaning towards a Palm OS device and still want these additional functions, they can be added later if you find you really need them.

8 **Is synchronization of data with other handheld computers, personal computers, or printers important?** Most handheld computers come with a cradle that connects to the USB or serial port on your computer so that you can synchronize data. An infrared port, however, allows you to synchronize data with any device, including other handheld computers that have a similar infrared port.

9 **If you travel often, then consider e-mail and Web access from your handheld computer.** Some handheld computers come with a modem that can send and receive data across telephone lines. Other handheld computers allow you to connect to your cellular telephone and use it as a modem. More expensive handheld computers have wireless capabilities built in. In either case, for a monthly network connection fee you can access your e-mail, company Web sites, and any other information on the World Wide Web from anywhere.

How to Install a Personal Computer

It is important that you spend time planning for the installation of your computer. Follow these steps to ensure your installation experience will be a pleasant one and that your work area is safe, healthy, and efficient.

1 **Read the installation manuals before you start to install your equipment.** Many manufacturers include separate installation instructions with their equipment that contain important information. You can save a great deal of time and frustration if you make an effort to read the manuals.

2 **Do some research.** To locate additional instructions on installing your computer, review the computer magazines or Web sites listed in Figure 15 to search for articles on installing a computer.

WEB SITE	URL
Getting Started/Installation	
Computers 101	newsday.com/plugin/c101main.htm
HelpTalk Online	helptalk.com
Ergonomics	
Ergonomic Computing	cobweb.creighton.edu/training/ergo.htm
Healthy Choices for Computer Users	www-ehs.ucsd.edu/ergo/ergobk/vdt.htm
Video Display Terminal Health and Safety Guidelines	uhs.berkeley.edu/Facstaff/Ergonomics

For an updated list of reference materials, visit scsite.com/dc2002/ch8/buyers.htm.

Figure 15 Web references on setting up and using your computer.

3 **Set up your computer in a well-designed work area, with adequate workspace around the computer.** Ergonomics is an applied science devoted to making the equipment and its surrounding work area safer and more efficient. Ergonomic studies have shown that using the correct type and configuration of chair, keyboard, monitor, and work surface will help you work comfortably and efficiently, and help protect your health. For your computer workspace, experts recommend an area of at least two feet by four feet. Figure 16 illustrates additional guidelines for setting up your work area.

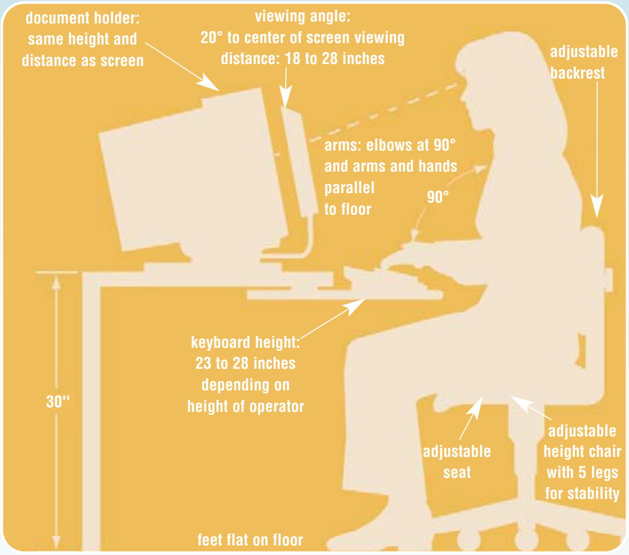

document holder: same height and distance as screen
viewing angle: 20° to center of screen viewing distance: 18 to 28 inches
adjustable backrest
arms: elbows at 90° and arms and hands parallel to floor
90°
keyboard height: 23 to 28 inches depending on height of operator
30"
adjustable seat
adjustable height chair with 5 legs for stability
feet flat on floor

Figure 16 A well-designed work area should be flexible to allow adjustments to the height and build of different individuals. Good lighting and air quality also are important considerations.

4 **Install bookshelves.** Bookshelves above and/or to the side of your computer area are useful for keeping manuals and other reference materials handy.

5 **Have a telephone outlet and telephone or cable connection near your workspace so you can connect your modem and/or place calls while using your computer.** To plug in your modem to dial up and access the World Wide Web, you will need a telephone outlet or cable connection close to your computer. Having a telephone nearby also helps if you need to place business or technical support calls while you are working on your computer. Often, if you call a vendor about a hardware or software problem, the support person can talk you through a correction while you are on the telephone. To avoid data loss, however, do not place floppy disks on the telephone or near any other electrical or electronic equipment.

6 **While working at your computer, be aware of health issues.** Working safely at your computer requires that you consider several health issues. To minimize neck and eye discomfort, for instance, obtain a document holder that keeps documents at the same height and distance as your computer screen. To provide adequate lighting that reduces eye strain, use non-glare light bulbs that illuminate your entire work area. Figure 17 lists additional computer user health guidelines.

Computer User Health Guidelines

1. Work in a well-designed work area. See Figure 16 on the previous page.
2. Alternate work activities to prevent physical and mental fatigue. If possible, change the order of your work to provide some variety.
3. Take frequent breaks. Every fifteen minutes, look away from the screen to give your eyes a break. At least once per hour, get out of your chair and move around. Every two hours, take at least a fifteen-minute break.
4. Incorporate hand, arm, and body stretching exercises into your breaks. At lunch, try to get outside and walk.
5. Make sure your computer monitor is designed to minimize electromagnetic radiation (EMR). If it is an older model, consider adding EMR reducing accessories.
6. Try to eliminate or minimize surrounding noise. Noisy environments contribute to stress and tension.
7. If you frequently use the telephone and the computer at the same time, consider using a telephone headset. Cradling the telephone between your head and shoulder can cause muscle strain.
8. Be aware of symptoms of repetitive strain injuries: soreness, pain, numbness, or weakness in neck, shoulders, arms, wrists, and hands. Do not ignore early signs; seek medical advice.

Figure 17 Following these health guidelines will help computer users maintain their health.

7 **Obtain a computer tool set. Computer tool sets include any screwdrivers and other tools you might need to work on your computer.** Computer dealers, office supply stores, and mail-order companies sell these tool sets. To keep all the tools together, get a tool set that comes in a zippered carrying case.

8 **Save all the paperwork that comes with your computer.** Keep the documents that come with your computer in an accessible place, along with the paperwork from your other computer-related purchases. To keep different-sized documents together, consider putting them in a manila file folder, large envelope, or sealable plastic bag.

9 **Record the serial numbers of all your equipment and software.** Write the serial numbers of your equipment and software on the outside of the manuals packaged with these items. As noted in the next section, you also should create a single, comprehensive list that contains the serial numbers of all your equipment and software.

10 **Complete and send in your equipment and software registration cards.** When you register your equipment and software, the vendor usually enters you in its user database. Being a registered user not only can save you time when you call with a support question, it also makes you eligible for special pricing on software upgrades.

11 **Keep the shipping containers and packing materials for all your equipment.** Shipping containers and packing materials will come in handy if you have to return your equipment for servicing or must move it to another location.

12 **Identify device connectors.** At the back of your computer, you will find a number of connectors for your printer, monitor, mouse, telephone line, and so forth (Figure 18). If the manufacturer has not identified them for you, use a marking pen to write the purpose of each connector on the back of the computer case.

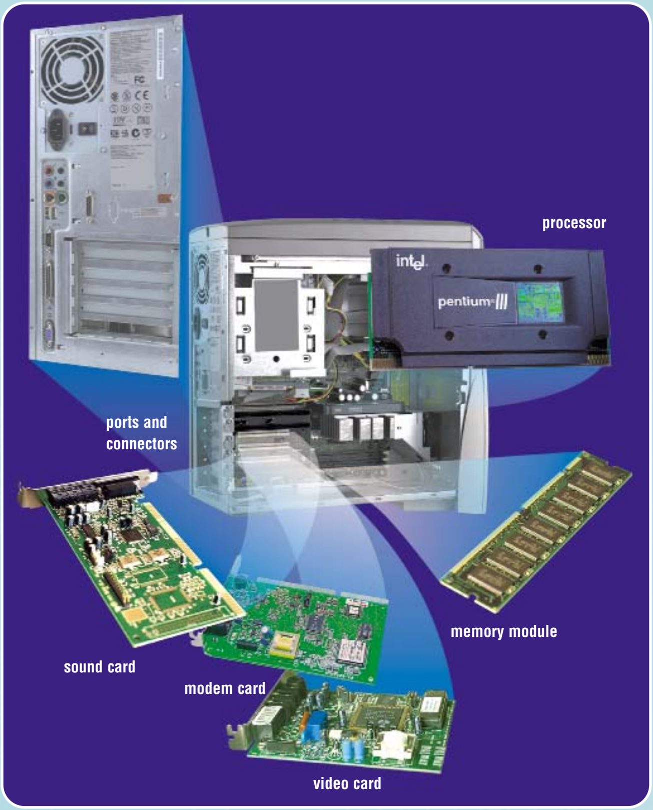


Figure 18 Inside the system unit and the connectors at the back.

13 **Install your computer in an area where you can maintain the temperature and humidity.** You should keep the computer in an area with a constant temperature between 60°F and 80°F. High temperatures and humidity can damage electronic components. Be careful when using space heaters, for example, as the hot, dry air they generate can cause disk problems.

14 **Keep your computer area clean.** Avoid eating and drinking around your computer. Also, avoid smoking. Cigarette smoke can damage the floppy disk drives and floppy disk surfaces.

15 **Check your home or renter's insurance policy.** Some renter's insurance policies have limits on the amount of computer equipment they cover. Other policies do not cover computer equipment at all if it is used for business. In this instance, you may want to obtain a separate insurance policy.

How to Maintain Your Computer

Even with the most sophisticated hardware and software, you will need to do some type of maintenance to keep everything working properly. You can simplify and minimize the maintenance by following the steps listed below.

1 **Start a notebook that includes information on your computer.** Keep a notebook that provides a single source of information about your entire computer, both hardware and software. Each time you make a change to your computer, such as adding or removing hardware or software or altering computer parameters, record the change in your notebook. Include the following items in your notebook:

- Vendor support numbers from your user manuals
- Serial numbers of all equipment and software
- User IDs, passwords, and nicknames for your ISP or OSP, network access, Web sites, and so on
- Vendor and date of purchase for all software and equipment
- Trouble log that provides a chronological history of equipment or software problems
- Notes on any discussions with vendor support personnel

Figure 19 provides a suggested outline for the contents of your notebook.

PC OWNER'S NOTEBOOK OUTLINE

1. Vendors
   - Vendor
   - City/State
   - Product
   - Telephone #
   - URL
2. Internet and online services information
   - Service provider name
   - Logon telephone number
   - Alternate logon telephone number
   - Technical support telephone number
   - User ID
   - Password
3. Web site information
   - Web site name
   - URL
   - User ID
   - Password
   - Nickname
4. Serial numbers
   - Product
   - Manufacturer
   - Serial #
5. Purchase history
   - Date
   - Product
   - Manufacturer
   - Vendor
   - Cost
6. Software log
   - Date installed/uninstalled
7. Trouble log
   - Date
   - Time
   - Problem
   - Resolution
8. Support calls
   - Date
   - Time
   - Company
   - Contact
   - Problem
   - Comments
9. Vendor paperwork

Figure 19 To keep important information about your computer on hand and organized, use an outline such as this sample outline.

2 **Before you work inside your computer, turn off the power and disconnect the equipment from the power source.** Working inside your computer with the power on can affect both you and the computer adversely. Thus, you should turn off the power and disconnect the equipment from the power source before you open a computer to work inside. In addition, before you touch anything inside the computer, you should touch an unpainted metal surface such as the power supply. Doing so will help discharge any static electricity that could damage internal components.

3 **Keep the area surrounding your computer dirt and dust free.** Reducing the dirt and dust around your computer will reduce the need to clean the inside of your computer. If dust builds up inside the computer, remove it carefully with compressed air and a small vacuum. Do not touch the components with the vacuum.

4 **Back up important files and data.** Use the operating system or utility program to create an emergency or rescue disk to help you restart your computer if it crashes. You also regularly should copy important data files to disks, tape, or another computer.

5 **Protect your computer from viruses.** A computer virus is a potentially damaging computer program designed to infect other software or files by attaching itself to the software or files with which it comes in contact. Virus programs are dangerous because often they destroy or corrupt data stored on the infected computer. You can protect your computer from viruses by installing an antivirus program.

6 **Keep your computer tuned.** Most operating systems include several computer tools that provide basic maintenance functions. One important tool is the disk defragmenter. Defragmenting your hard disk reorganizes files so they are in contiguous (adjacent) clusters, making disk operations faster. Some programs allow you to schedule maintenance tasks for times when you are not using your computer. If necessary, leave your computer on at night so it can run the required maintenance programs. If your operating system does not provide the tools, you can purchase a stand-alone utility program to perform basic maintenance functions.

7 **Learn to use diagnostic tools.** Diagnostic tools help you identify and resolve problems, thereby helping to reduce your need for technical assistance. Diagnostic tools help you test components, monitor resources such as memory and processing power, undo changes made to files, and more. As with basic maintenance tools, most operating systems include diagnostic tools; you also can purchase or download many stand-alone diagnostic tools.